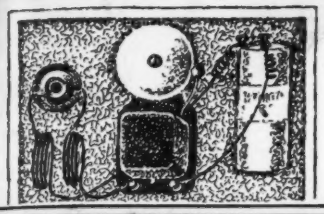
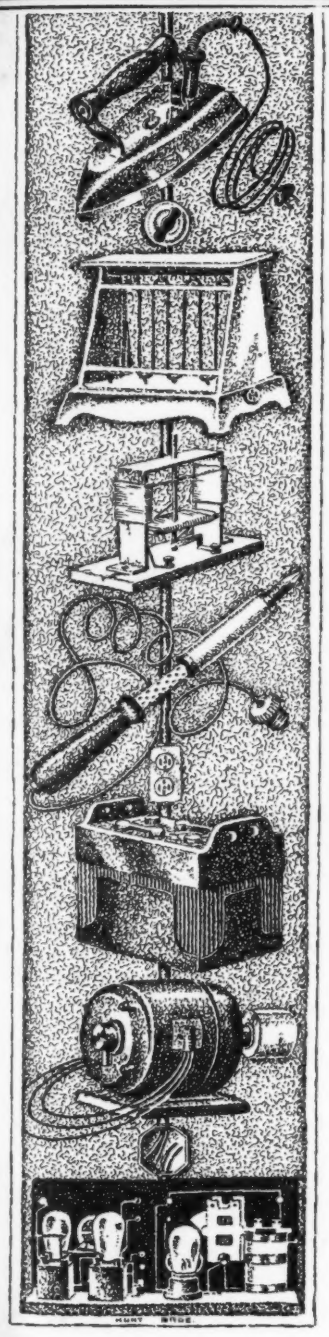
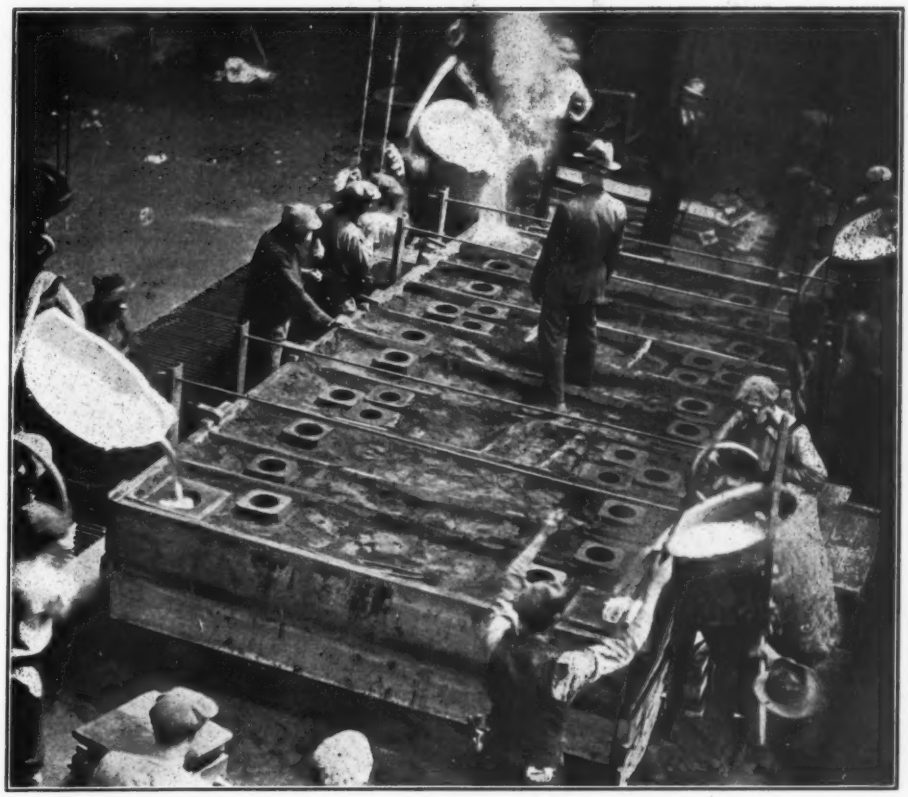


NOVEMBER 1934

INDUSTRIAL ARTS AND VOCATIONAL EDUCATION





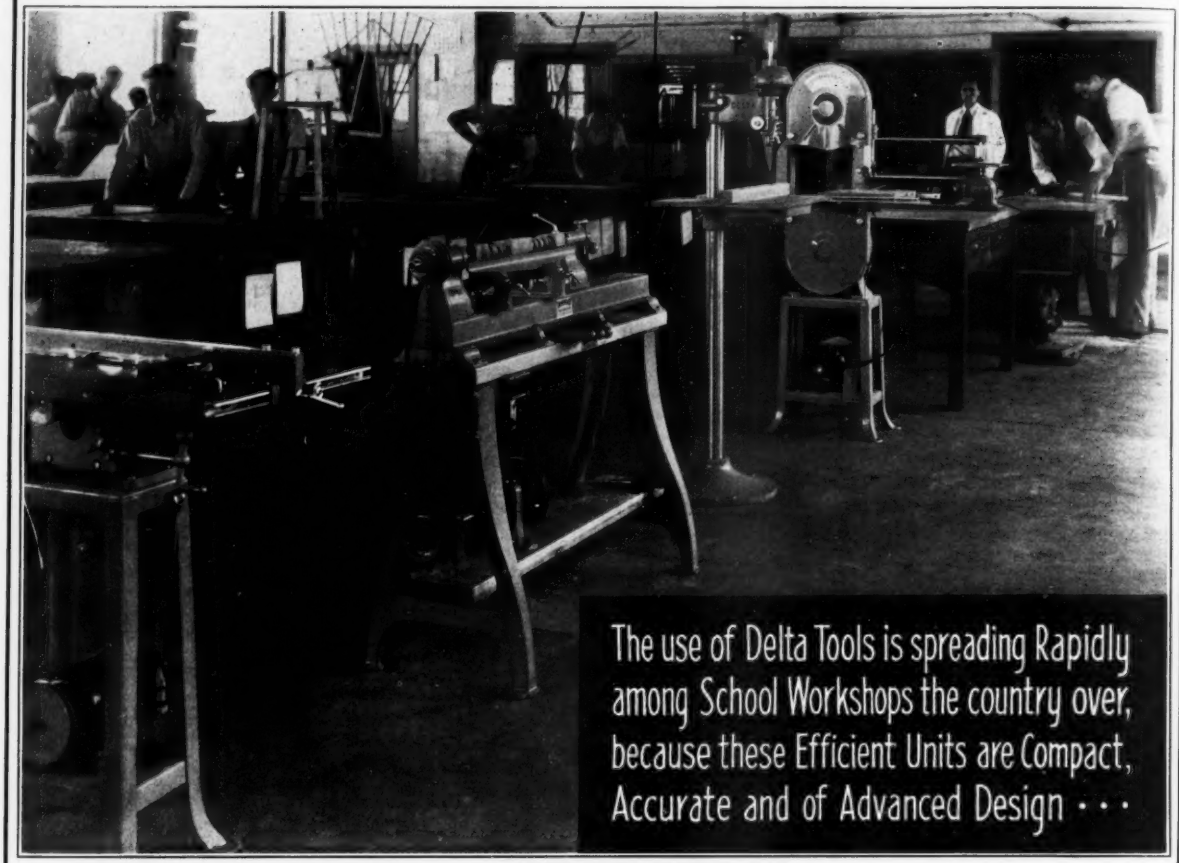
THIS ISSUE

Social-Industrial Education *by C. A. Bowman and B. C. Shafer*

The Project Method in Printing *by R. Randolph Karch*

The Bruce Publishing Company

New York Milwaukee Chicago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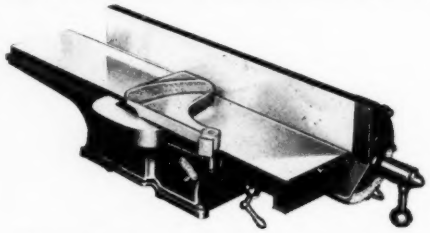

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INDUSTRIAL ARTS and VOCATIONAL EDUCATION
November, 1934
Vol. 23, No. 11

Social-Industrial Education

C. A. Bowman
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The Stout Institute, Menomonie, Wisconsin

Economic change in an interdependent society necessitates the social identification and interpretation of levels, divisions, and locations of the content in industrial education.

AS MEMBERS of the faculty of a teacher-training institution, the authors are endeavoring to interpret and translate the procession of current social developments. The present article is by way of a current study of available material. It is submitted for the purpose of provoking study and interpretive efforts on the part of industrial-arts and vocational-industrial teachers. At the present rate by the time it is printed, numerous new contributing events will have taken place. Besides the newspapers and the radio, the following were used for direction-pointing material:

National Education Association Committee Report on "The Social-Economic Goals of America"
President Roosevelt's address to the NRA code authorities
Reports by the Joint Commission on the Emergency in Education
The Literary Digest, March 3, 1934, "At the Observation Post"
John Dewey, et al., *Educational Frontier*
Committee on Progressive Education
Wisconsin Teachers Association Bulletin, November, 1933
Stuart Chase, *The Economy of Abundance*
Lyman Bryson, "Education for What?" *Survey Graphic*, December, 1933
Monthly Labor Review
Recent Social Trends
Selected Codes
Monthly Survey of Business, American Federation of Labor

No fact is more evident today than that we are living in a swiftly changing interdependent world. On June 28, 1914, two Serbian youths assassinated an Austrian archduke. August, 1914, nearly all Europe is at war. April, 1917, the United States declares war on Germany. June, 1919, the war which cost $337,000,000,000 is brought to a close when the allies forced a Carthaginian peace on Germany. 1922–1929, a post-war illusory boom brings seeming prosperity, but intensifies *laissez faire* individualism, national and international economic anarchy. October, 1929, a stock-market crash marks the deepening world depression and crisis. November, 1933, the Federal Bureau of Education states that 200,000 certified teachers are without teaching jobs; that 25 per cent of the employed teachers are getting less than $728 a year; that educational programs are being drastically reduced, courses vitally needed for the workers (such as industrial education) eliminated; and that schools are overcrowded and undermanned.

To be sure, there is not a direct cause-and-effect relationship here, but the events are certainly interdependent. Did the teachers have anything to say about them? No! They seemed to be living almost in an intellectual vacuum, just as the business man seemed to be living in an economic vacuum. Complacent and self-satisfied, or timid and nearsighted, they conceived their function in society to be one akin to that of the medieval cloistered monk. For the most part, like the blind mice, they did not look where they were going, and as a result had their jobs cut off, their salaries reduced, and worst of all, the education system permanently harmed. Does one need to ask why these economic and social calamities overtook us? The answer, insofar as education is concerned, is obvious. Teachers, among other people, were partially at fault. They did not help plan their society. They thought it would run of its own accord. They failed to socially identify and interpret the levels of education in terms of a planned, equitable, stable society. Teachers, however, unlike the mice, cannot remain permanently blind and remain good teachers. Neither can they, like the ostrich, stick their heads into the sand in time of danger if they would keep their jobs, obtain happiness of any sort, or if they would think of the potential jobs, and happiness of their students. Teachers cannot any longer imagine they are isolated, independent, professional academicians, teaching isolated interdependent bodies of knowledge. They must realize the interdependency of all social functions. They must plan their work on this basic fact — that some degree of economic security is necessary before real learning can take place.

The future of the student and teacher, learners on all levels of education, depends on what happens or may happen to the economic system. The future of the economic system to a considerable extent depends on what and how teachers teach, assuming, of course, that economic conditions permit them to teach yet a while longer. The cataclysmic economic changes necessitate, then, constant reorientation and recasting of the educational system, both in theory and practice, with that end in view. The teacher must change his methods and aims. He must, if education is to be adjudged at all valuable and worth while. He must, if society is not to collapse. Inevitably, whether he desires or not, he must face economic, social, and political problems, and he must plan the content and method of his teaching accordingly. As John Dewey, always on the educational frontier, succinctly states this, the most significant problem in education today, "We must not only educate individuals to live in a world where social conditions beyond the reach of any one individual will affect his security, his work, his achievements, but we must (and for educational reasons) take account of the total incapacity of the doctrine of competitive individualism to work anything but harm in the state of interdependence in which we live."

From Figure 1 it seems that the New Deal presents a wider range of contributing channels for education. As shown, the seven cardinal principles of secondary education found in the 1918 report of the N.E.A. committee are identified in the diagram shown in Figure 1. The development of ethical culture and the development of a command of fundamental processes are represented as basic and underlying all individual

development. The other five objectives are identified as five lines of development, progress in all being necessary to maintain a balanced development for the individual. The numbers 1 to 6 in the vocational progress of the individual refer to the steps identified by Dr. Brewer, the study of one's interests and abilities, the study of the world of occupations, the choice of a vocation, the preparation for the vocation, the advantageous entry into the vocation, the adjustment and promotion. With the provision for occupational retraining included, industrial-arts and vocational-industrial education will continue and amplify their contributions in this goal.

The vocational in the 1918 portion, as shown by Figure 1, is carried forward into the 1933 portion in the Suitable Occupation Goal, the Economic Security Goal, and the distributing circle leading to Mental Security, Equality of Opportunity, Freedom, and Fair Play. The committee report suggests numerous classifications of related social-material topics under which may be studied the effects of change in industry on people.

Of what good is the recognition of this problem, many ask? And they rationalize, we cannot do anything about it anyhow. These pessimistic, mentally dead survivors of a bygone era

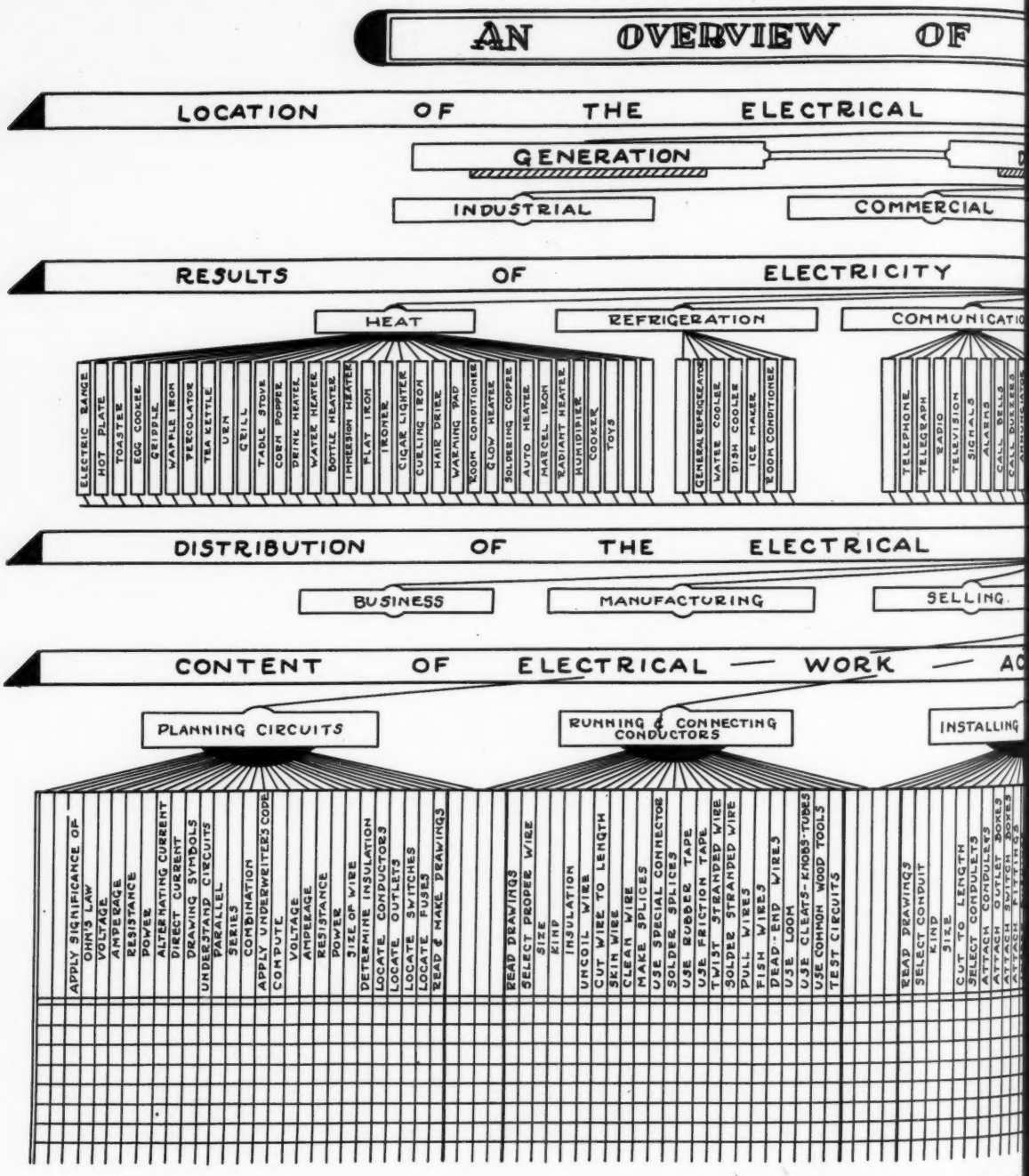
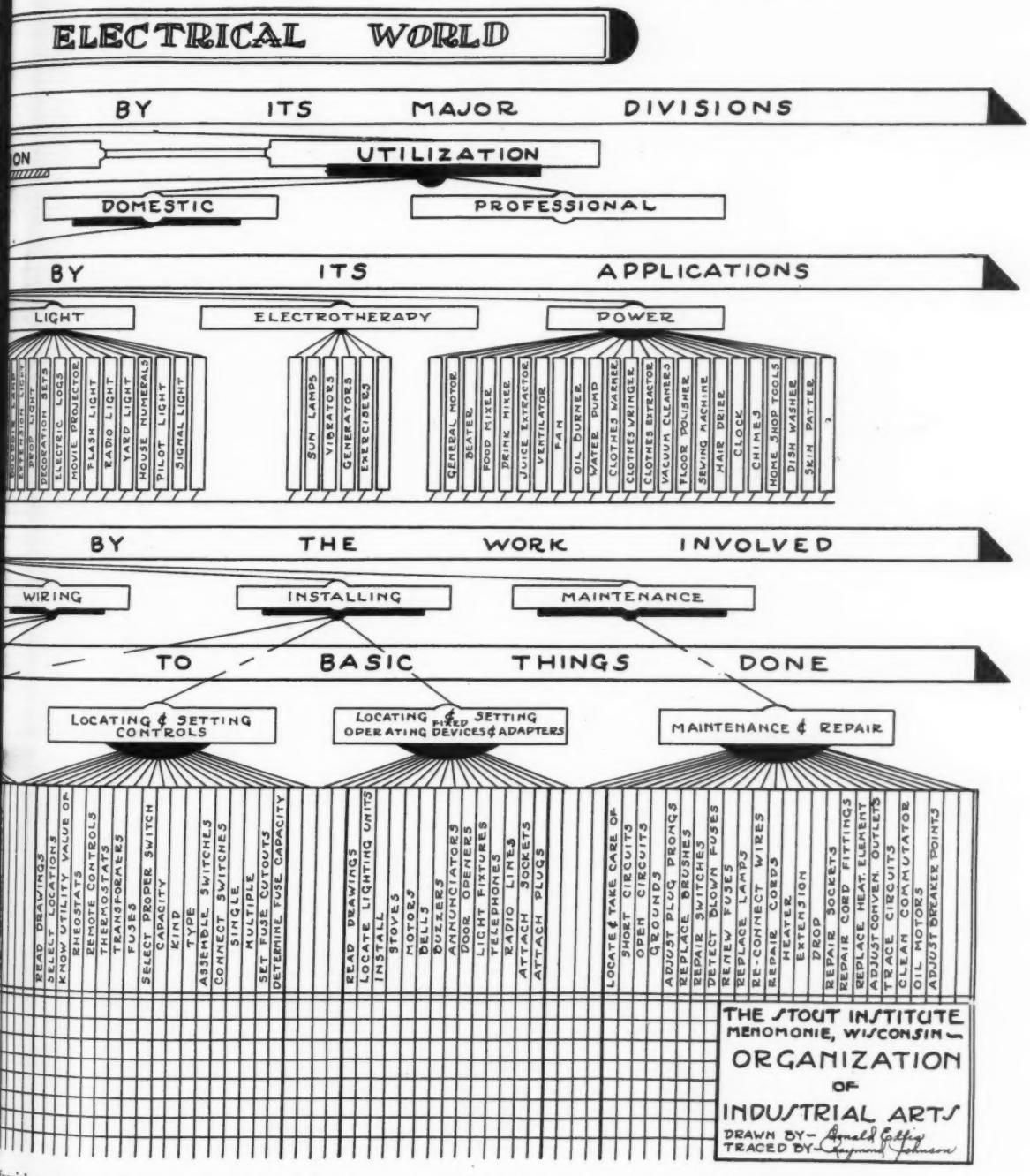


Figure 2 is a suggestive arrangement of classifications of significance in the social stage setting of electrical work. For instance, in the beginning industrial-arts course in electrical work, the "basic things done" shown at the bottom may be oriented in the several levels leading up. The "work divisions," the "application," and the "major divisions"

evidently either do not realize the immense, grand potentialities of the modern world, or the terrific possibilities of catastrophe — or perhaps they are just lazy. They have stopped in their thinking in the nineteenth-century economy of scarcity, with the obsolete theories of the "economic man," and "acquisitive instincts." They mistake hunger and misery, custom and habit, reflex and urge, for generalized, universal law, forgetting that, after all, education and social environment determine and *can* determine to a considerable extent, the direction which urges and reflexes, customs and habits take, whether they bring hunger and misery or abundance and the good life. We have, we know, in these days of men wading knee-deep in wheat to get to the bread lines, plenty of food, clothing materials, technological and natural resources and energy — though we lack something in the way of shelter, transportation, and skilled labor as Stuart Chase has pointed out — to give every man, woman, and child, red, white, and black, at least a health-and-decency standard of living. With the grandest resources, techniques, and technological opportunities ever bequeathed man, *we can*, if we will, construct a new society. But whether we can or not, we are confronted with the dilemma of trying or having civilization disappear under our eyes.



furnish a skeleton showing how the social significance of electrical work may be given an initial integrated location. They furnish a skeleton around which the related social material for industrial courses may be arranged

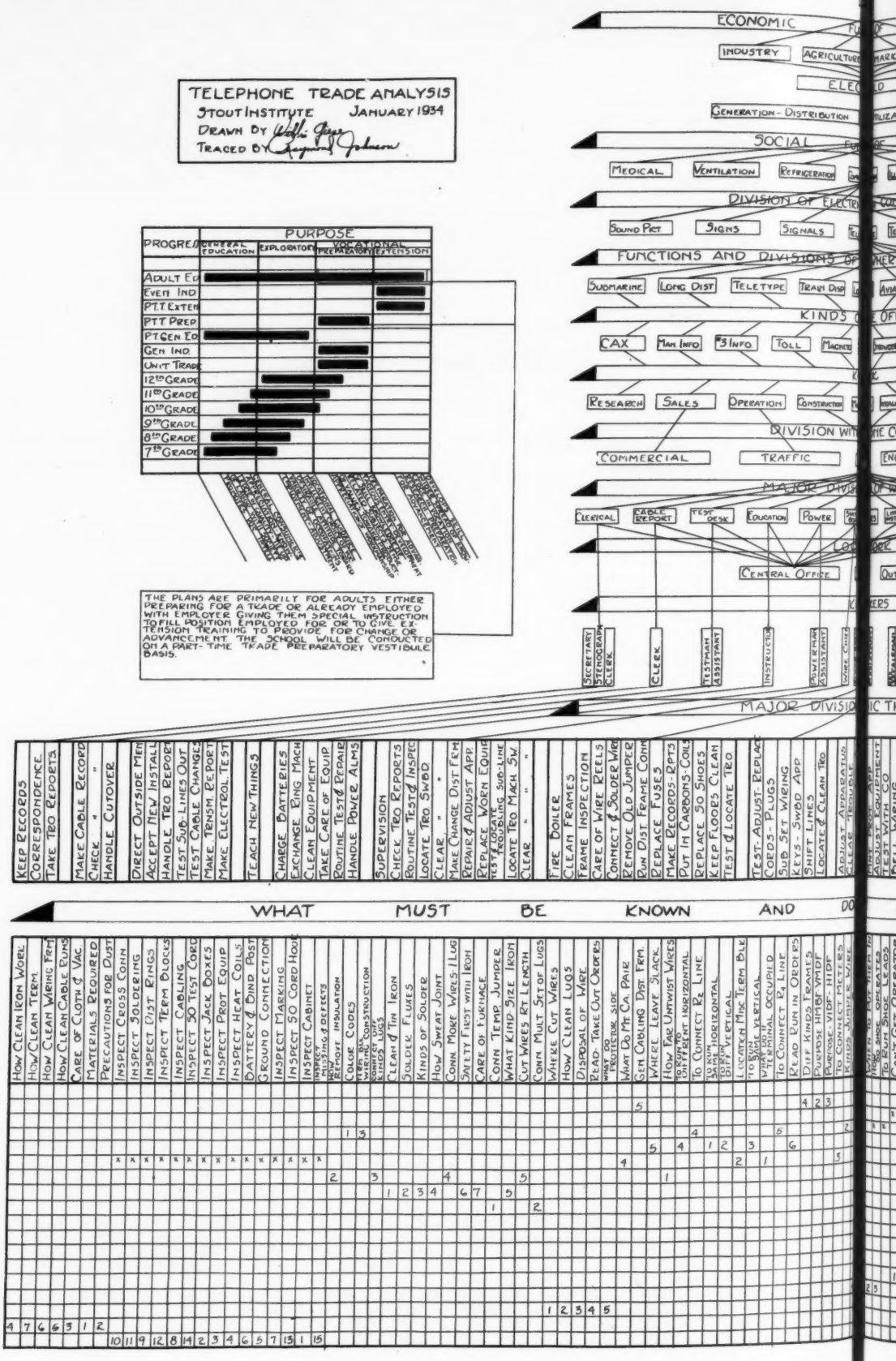
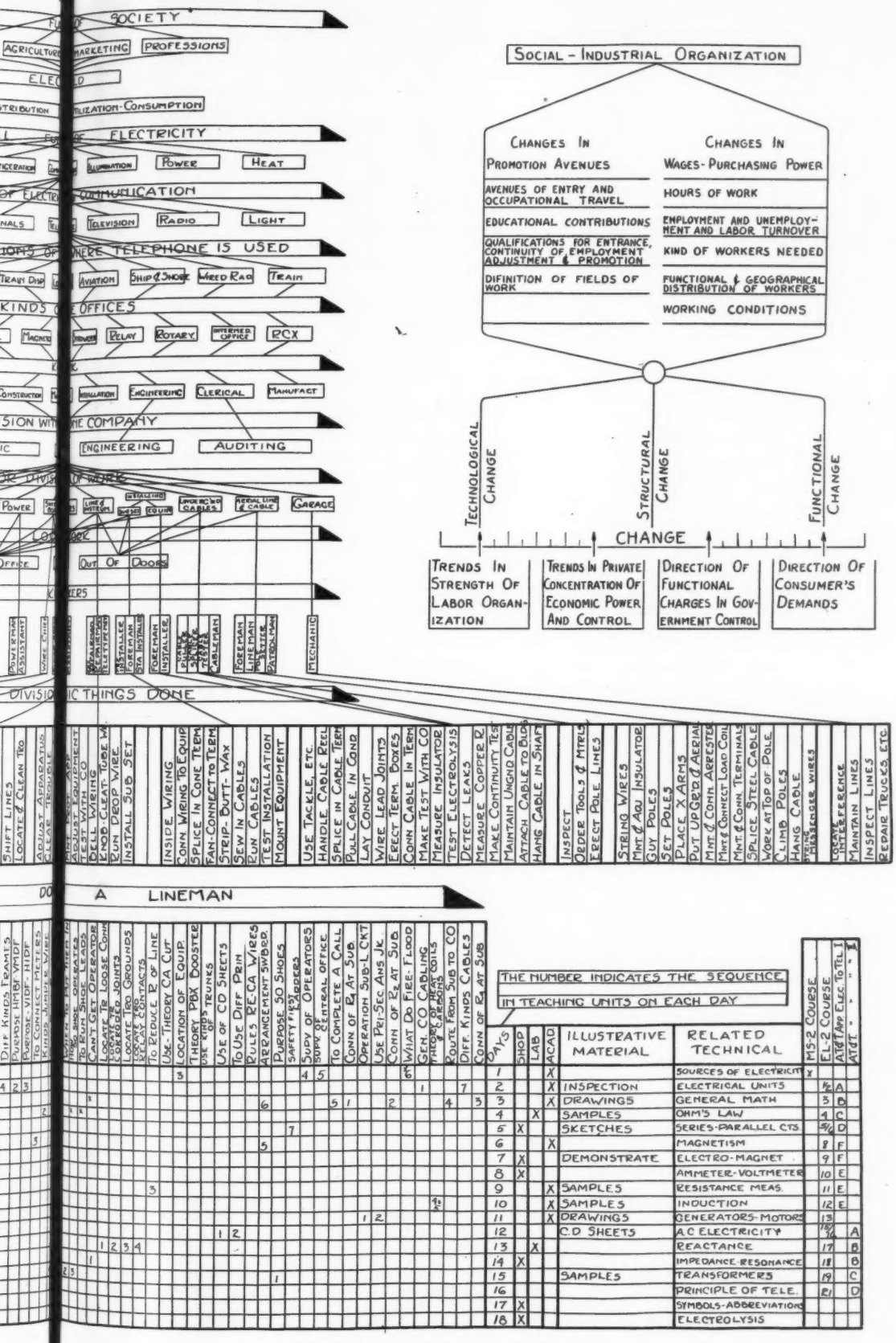


Fig. 3. Related Social Information



SOCIAL - INDUSTRIAL ORGANIZATION
CHANGES IN PROMOTION AVENUES
AVENUES OF ENTRY AND OCCUPATIONAL TRAVEL
EDUCATIONAL CONTRIBUTIONS
QUALIFICATIONS FOR ENTRANCE, CONTINUITY OF EMPLOYMENT ADJUSTMENT & PROMOTION
DIFINITION OF FIELDS OF WORK
CHANGES IN WAGES - PURCHASING POWER
HOURS OF WORK
EMPLOYMENT AND UNEMPLOYMENT AND LABOR TURNOVER
KIND OF WORKERS NEEDED
FUNCTIONAL & GEOGRAPHICAL DISTRIBUTION OF WORKERS
WORKING CONDITIONS
TECHNOLOGICAL CHANGE
STRUCTURAL CHANGE
FUNCTIONAL CHANGE
CHANGE
TRENDS IN STRENGTH OF LABOR ORGANIZATION
TRENDS IN PRIVATE CONCENTRATION OF ECONOMIC POWER AND CONTROL
DIRECTION OF FUNCTIONAL CHARGES IN GOVERNMENT CONTROL
DIRECTION OF CONSUMER'S DEMANDS

THE NUMBER INDICATES THE SEQUENCE IN TEACHING UNITS ON EACH DAY

DAYS	SHOP	LAB	ACAD	ILLUSTRATIVE MATERIAL	RELATED TECHNICAL	MS-2 COURSE	EL-2 COURSE	AT&T APP ELEC. TO TEL. I	AT&T " " " II
1			X		SOURCES OF ELECTRICITY	X			
2			X	INSPECTION	ELECTRICAL UNITS		½	A	
3			X	DRAWINGS	GENERAL MATH		3	B	
4		X		SAMPLES	OHM'S LAW		4	C	
5	X			SKETCHES	SERIES-PARALLEL CTS		5½	D	
6			X		MAGNETISM		8	F	
7	X			DEMONSTRATE	ELECTRO-MAGNET		9	F	
8	X				AMMETER-VOLTMETER		10	E	
9			X	SAMPLES	RESISTANCE MEAS.		11	E	
10			X	SAMPLES	INDUCTION		12	E	
11			X	DRAWINGS	GENERATORS-MOTORS		13		
12				C.D SHEETS	A.C ELECTRICITY		16		A
13		X			REACTANCE		17		B
14	X				IMPEDANCE-RESONANCE		18		B
15				SAMPLES	TRANSFORMERS		19		C
16					PRINCIPLE OF TELE.		21		D
17	X				SYMBOLS-ABBREVIATIONS				
18	X				ELECTROLYSIS				

(See descriptive legend top of page 340)

(Legend to accompany Figure 3 shown on pages 338 and 339)

Figure 3 may be used for a typical forward look into the occupational possibilities of electrical work in one of the occupational divisions. In the center of the diagram is shown an analysis of certain vocational classifications in telephone work. It gives detail at the bottom in a sample occupation. At the left is an index of purpose and progress classifications of school pupils with the probable location of an individual who would be taking vocational preparation for the occupational classifications indicated in the center. At the right is the tabulated listing of the divisions of related social information. They are placed here for the purpose of this article. Usually they are indicated in the lower right corner with related technical. Just as the industrial teacher correlates his work with the content in science, mathematics, drawing, etc., so will he correlate with the social science.

Besides experiences using tools and materials, learning constructions and making installations, there are social controls which render technical skills and technical knowledge ineffective. Things happen which are not understood. Change comes to be regarded as something to be feared, a hazard or a menace which threatens constantly to eliminate the occupation or to so change it as to make it impossible for the worker to continue. The graph also shows some suggestions as to the range of possible change in communication.

In the studies of related social information, the electrician, as he goes through the various steps of his vocational progress, will find that the related social information surrounding the classifications in Figure 3, will carry him up to rather broad controls as indicated in condensed form at the top. He will discover that his related social information which begins with his own particular shop, will lead him through direct lines to a study of our entire social structure. He will identify the facts under the related social information at the right in Figure 3, as those with which he is intimately concerned as a member of society.

The old educational system was well fitted to a society based on an economy of scarcity. Economic necessity and sound educational principle demand that the new evolving system be fitted in part for the purpose of helping make a society which will, by its methods of production, distribution, and consumption, give these economic minima to all. At the same time, education must train individuals to perform a useful, needed, and definite function in that society. In the past the function of education has been popularly conceived as that of preparing the individual for life, for his entrance into society, but educators neither took time to find out what economic system was, or how the products of their institutions affected, nor were affected by that system. In the future, teachers and administrators must try not only to fit the individual *for* society, but to make him fit *into* that society. They must, in consequence, attempt to make certain that their students find a society well enough planned to furnish opportunity for functioning and means for a livelihood.

Nowhere is this new emphasis more needed than in industrial education. At no point in the curriculum of modern education can the problem be more vitally attacked. In direct contact

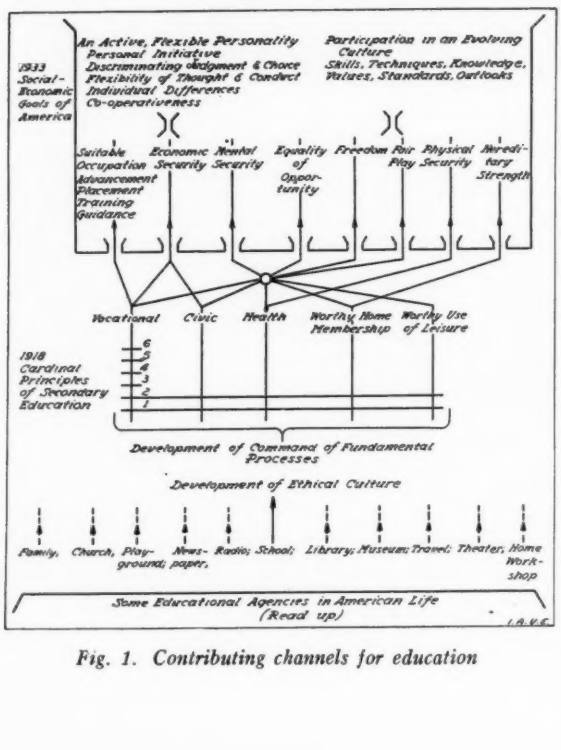


Fig. 1. Contributing channels for education

with industry, with the essential knowledge of fundamental economic processes in their possession, industrial educators can, if they will, make significant contributions to that social understanding requisite for social reconstruction. The industrial educator who essays in this new field may carve a niche for himself in education and society.

New social frontiers bring new responsibilities, new problems, and new opportunities to all social agencies. Social agencies, like education, must absorb these new opportunities and responsibilities as fast as they are able; and they must appropriate to themselves new means by which their added social functions can be performed. If they do not, or if they react half-heartedly or poorly, they must be content to see these functions transferred to other agencies or to see society permanently retarded.

The printshop will see certain phases of the work of duplicating recorded material transferred to the roto-print shop. Some other portions of duplicating will go to the mimeograph, ditto, multigraph, or commercial bookkeeping machines. The monotype caster takes over the production of type. The duplicating function will spread to still other agencies unless the printshop takes these agencies into its plan. The railroads were slow in realizing that they were performing a social function instead of operating a monopoly. They belatedly are incorporating modern means for performing their social service now — stream-lined, air-conditioned, light-weight, high-speed passenger trains operating at low cost, and truck and train handling of freight, are some indications. Spot-welding has taken the place of rivets in some places. Electric welding in building construction promises much. New alloys, new fluxes, new welding rods, bring new possibilities and new procedures in metal work and metal maintenance almost daily.

In the kaleidoscope of American life, however, change occurs not only in materials, construction, assemblies, machine procedure-sequences, unit and basic operations, but also (see related social information, Fig. 3) in the control and ownership of industry, in the political control of industry, in wages, hours of work, employment, working conditions, in the physical risks of any particular industry, in the unionization or nonunionization of employees, in consumption tastes, and in standards of living. Change in any one of these classifications directly or indirectly spreads to all the rest. The creation of the Tennessee Valley Authority will permanently affect the whole electrical industry. Through section 7A of the NRA, the Roosevelt administration hopes to give workers greater bargaining power than they ever had, in order that wages will be pushed up, hours shortened, and more men will be employed. As many economists claim, rather than pay higher wages, the employers are using more machines, and consequently many craftsmen are being thrown out of work again. Thus many social factors outside industry and labor, constantly and deeply condition and affect them. If industry does not change, it goes bankrupt. If laborers do not attempt to control their jobs, they lose them. And if industry and labor are radically affected by social change, industrial education must take cognizance of the fact. Industrial educators have long been keenly conscious of the changes in mechanics and technics. They must now go beyond these changes and note deeply the social and economic changes, on what mechanical change, on what jobs, are the last analyses dependent. The new and novel of today is the commonplace of tomorrow. Education, industrial education, must not only keep pace with the commonplace, but resolutely face tomorrow, else it and society founder.

As a result of social and economic changes, education must and rapidly is changing its objectives. Adult education for leisure, adult education for occupational retraining, organized consumer preparation, educational provision for all under 18 years of age, and a rapidly broadening conception of the contributions of practical arts in general education — these are but a few of the sources of new challenges for the industrial-arts teacher and the teacher of vocational-industrial education. They must meet still further challenges, however. By the

nature of their work, they must now become almost as proficient in politics, economics, and sociology, as they are in their shops, because their shops will be empty if keen realization of economic, political, and social change is not always in evidence.

All that is acquired by the individual student in industrial-arts or in vocational-industrial work is of significance to him ultimately both in his avocational activities and satisfactions, and his activity as a social being. Apart from the possibilities of the avocational, his acquisitions are of significance to him in terms of the social stage setting. Exploratory experiences, the orienting of interests, aptitudes, and abilities, the development of consumer intelligence, the choice of a vocation, the preparation for a vocation, the securing of advantageous entry into one's chosen vocation, adjustment in the vocation, extension work, occupational retraining, or advanced general-education courses for the purposes of aiding the individual to interpret, use, control, and direct the mechanical advantages with which science has surrounded him — all have their ultimate significance for the individual only in terms of their place in the rapidly shifting modern social stage setting. The use, the "practicability" of them are all dependent on the kind of economic and social system in which they exist. See Figure 2 which shows the social significance of electrical work used as an integrating factor and Figure 3 which shows the "related social information."

In industrial arts, basic-acquaintance range for the boy will continue to be necessary. The objectives for industrial arts as identified by the American Vocational Association Committee on Standards of Attainment in Industrial Arts will continue, and of necessity, broaden. Actual participation cores of experiences in general metal, general woodworking, general drawing, general electrical, general printing and duplicating, and the like, will continue to be available for all boys. Vocational-preparation opportunities in up-to-date training facilities will be developed more and more. General education courses for individual activities in general mechanics and industrial mechanics will develop. All of this work will be supported and supplemented by adequate related technical information. *In addition, the modern industrial-arts and vocational-industrial courses must be supported and supplemented by adequate related social information.* The related technical and related social information must be regarded as the fact settings in which the various actual performances in the industrial courses will be located. To learn and know new tools, materials, constructions, and products is vitally important. To learn and know and control the social setting of new tools, materials, constructions, and products, so that they will contribute to the welfare of individual society and mankind, is just as significant and often even more vital. No matter how good a switchboard operator was, she lost her job when the automatic telephone came. No matter how skilled certain workers are at present, few job opportunities are open to them today. No matter how excellent the college graduate is, he finds today he has only one chance in three of obtaining a job. It would be of small worth to train boys and girls and men and women if jobs did not ever exist. Economic changes in an interdependent society do indeed necessitate the social identification and interpretation of levels, divisions, and locations of content in industrial education. The industrial educators must attempt to fit individuals for a function in a dynamic society, and at the same time help fashion a planned society in which the individual is to fit.

Virtually all of the change taking place now in our social-economic total, may be identified under one social fact: "We shift from an economy of scarcity to an economy of abundance." The turning point, though it is not yet fully realized, came shortly after 1900 when imperceptibly we entered the "power age." In 1918 educators did not perceive the real trend of events, though they clarified educational progress up to that time and pointed the way for future development by the cardinal principles of secondary education (see Fig. 1). In 1933, however, the committee report of the N.E.A. on social-economic goals of America takes keen cognizance of social and economic fact and quite definitely points out the direction of education in the future.

Far too often, the report rightly declares, primary, secondary, vocational, and collegiate schools have been so engrossed in making good scholars, good tradesmen, good technicians, good lawyers, and good doctors, that they have "thought little of their prior responsibility to make a good man, a good citizen, qualified to play his important part in achieving national goals." In the future, if education is to accept its social obligations as well as continue to fulfill a social function at all, it must orient itself so as to give each individual the highest degree of "hereditary strength" and "physical security." It must, moreover, afford each individual "participation in an evolving culture" making sure that every individual has a command of those skills, techniques, and knowledges that will enable him, to the limit of his innate capacity, "to use and enjoy the culture of his group." It must endeavor to give each individual "an active flexible personality," fit him for a "suitable occupation" through "guidance," "training," and "placement." More important at the present time, in order that these aims for the individual may be obtained, education must help erect a society that will afford "economic security," "mental security," "freedom of thought," and "equality of opportunity."

The acquisition of social information, and an attempt at social interpretation in the light of these ideals, then, of necessity, becomes part of industrial education. If society as a whole prospers, then industrial education will. But society will not prosper unless every industrial educator, every teacher, helps readjust inadequate social institutions to a changed economic order.

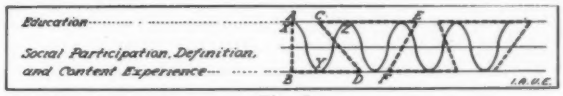


Fig. 4

The participation in an evolving culture calls for much in individual development. In Figure 4 is shown a graph in which the social progress of an individual (in this case an electrician who is just beginning his school life) is depicted in simplified form. At that time he does not know that he is to be an electrician. He pursues his education, and through the various controls of many agencies, finally leaves school to go to work. Point A in Figure 4 indicates his departure from school, and point B the beginning in his occupational experience. In all probability when he leaves school and seeks employment, the fact that he is inexperienced makes it necessary for him to begin his social progress lower down in the occupational scale than he anticipated. One of the outstanding ideas which he gets from this initial social contact, is the importance of experience. He then gains experience for a period of time. Seeking promotion or adjustment, he is very likely confronted with requirements which he cannot meet, because of the lack of an educational paralleling of his experience. The predominant idea in this experience is then one of need of education. He returns to his educational experience at point C. Carrying this forward when he again seeks employment, he does not secure as much advance as he had anticipated. Sooner or later comes realization of the fact that education and experience must co-operate. In other words, education is approaching the *co-operative* plan as illustrated by XYZ.

The implications in the "active flexible personality," center around change. To again bring these implications to a greatly simplified graph, Figure 5 may be used. Employers and employees are constantly seeking better tools. In the column at the left are listed the characteristics which are usually accepted as those of a better tool. There are certain results on people. Scanning these characteristics of the better tool in terms of their effects on people as producers, one of the basic factors in technological unemployment is identified. As the tool is improved, the human worker has his individual significance re-

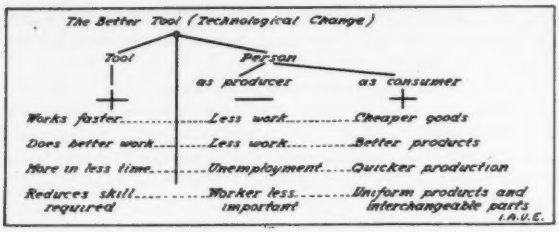


Fig. 5. Effect of Technological change

duced in hours, in skills, etc. Unless there is a compensating consumer improvement as a result of the use of the better tool, there is social loss.

In the March 3, 1934, *Literary Digest*, in the "At the Observation Post" column, attention is called to the fact that education has received treatment very different from that received during previous depressions. In past depressions the people of the United States have turned to education with much support and much hope. The serious financial problems confronting education during the present depression are explained in the above-mentioned article in terms of frontiers. During the past depressions, the people always had a frontier to look to for new hope. Now the explanation indicates that there is no frontier, and as a result, no hope.

It has been the purpose of this article to suggest that perhaps we have a social frontier before us now which in its possibilities for new hope and better living for all, far exceeds any geographical frontier the nation has ever had. In the old frontiers we had woods, Indians, and bears. In the social woods before us there are Indians camouflaged in disguises much more effective than any in the olden days. There are bears — and bulls, too. In the development of well-selected, well-integrated, up-to-date related social information in our industrial-arts courses and our vocational courses, teachers can make a distinct contribution to American progress. They can do their part as directed by President Roosevelt in his recent address to the NRA code authorities: "Let us consolidate our gains and let us resolve that the consolidation shall be for the continued progress and especially for the greater happiness and well-being of the American people."

Principles of Design—III

Franklin H. Gottshall

Scotch Plains, New Jersey

The third in the series of articles on the subject of design is based on the importance of proportion in matters of design.

PROPORTION

A THIRD important factor necessary to make an object beautiful is good proportion. The writer has heard speeches, read articles, and listened to conversations in which proportion was discussed at some length. It is a subject about which one hears a great deal in a general sort of way, but, as Mark Twain remarked about the weather, little or nothing is ever done about it. Good proportions are as important for securing pleasing form as proper space division, or proper outline enrichment. It is a factor that must be taken into account when solving the problems suggested by the first two articles. The division of masses, the enrichment of outlines, and the determination of good proportions are very closely related, and problems that arise regarding them must be solved simultaneously. To keep the subject of pleasing form, and how it may be secured, as simple as possible, the three problems are discussed separately. In actual practice, however, they cannot be considered separately.

Good proportions are the result of a proper relation of lines and masses. Certain relations of length to width are beautiful, while others differing only slightly may lack interest. By observing a few simple rules when planning space divisions, and various other problems that must be considered when formulating a design, most of the errors resulting in clumsy, graceless objects may be avoided.

An object that has good proportions has unity and harmony, because the different elements are properly related to each other. Objects on which the elements are identical, such as a square panel, might upon first thought seem to be well proportioned, because of this relation. Identical elements produce neither harmony nor beauty, but only mechanical effects. Pleasing proportions result from more subtle relationships. The eye finds greater pleasure in a rectangle, or a figure on which the relationship of elements is not quite so obvious. The same is true of curved and other figures. An oval is more beautiful than a circle, and an isosceles triangle more beautiful than an equilateral triangle. Good proportions result from subtle relationships of lengths to widths, or relationships which may not be too easily analyzed. In Figure 19, three objects, comparatively simple as to structure, are shown which owe a great deal of their beauty to properly planned proportions. It

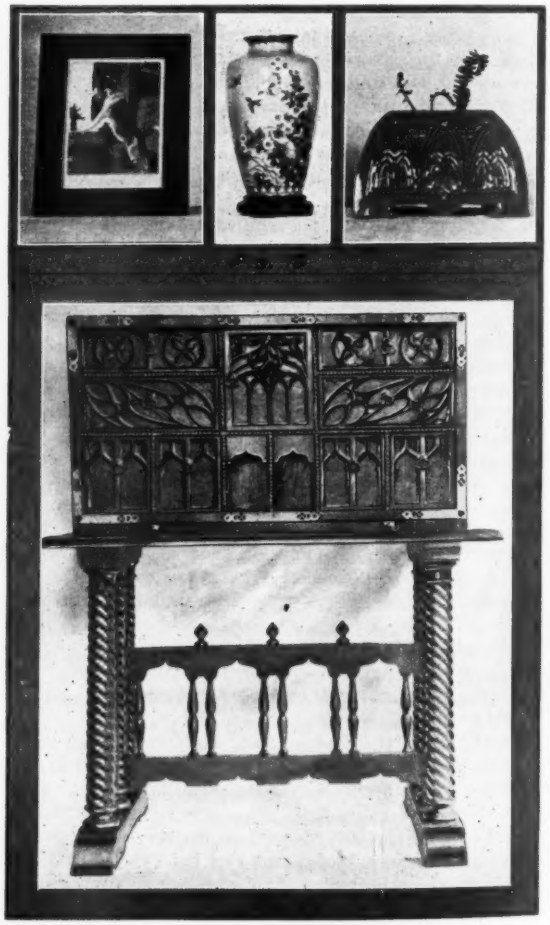


Fig. 19. Three objects showing good proportions
Fig. 21. A Spanish Vargueno

Sheraton Chest of Drawers.
FIG. 20
A PIECE OF FURNITURE ON WHICH THE PROPORTIONS OF THE MASSES HAVE BEEN THOUGHTFULLY PLANNED, MORE ESPECIALLY THE MINOR AREAS.

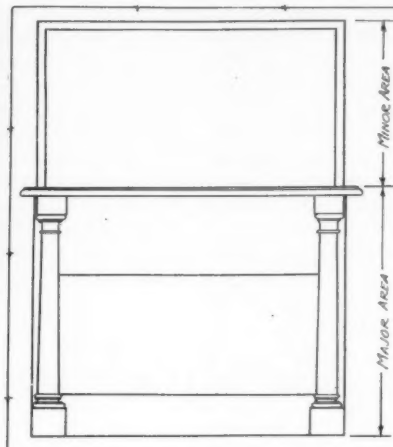


FIG. 22-A

PROPORTION OF PRIMARY MASS 3 TO 4
PROPORTION OF MAJOR AREA 7 TO 9
PROPORTION OF MINOR AREA 5 TO 9

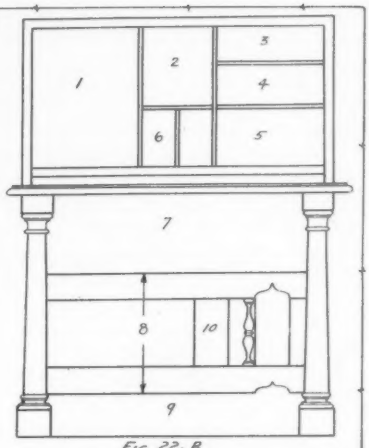


FIG. 22-B
PROPORTIONS OF MINOR AREAS

ONE - 3 TO 4	FIVE - 12 TO 7	EIGHT - 2 TO 1	
TWO - 8 TO 9	SIX - 7 TO 4	NINE - 6 TO 1	
THREE - 3 TO 1	SEVEN - 3 TO 1	TEN - 2 TO 1	
FOUR - 12 TO 5	SUBDIV. OF THREE - 2 TO 3		
	SUBDIV. OF FIVE - 6 TO 7		

is impossible to tell at a glance just what relationships of length and width exist; but that there are definite relationships, and that they are harmonious is quite evident. There should not be too great a contrast of length to width. This should be true, not only of rectangles, but of ovals, triangles, and other figures as well. Since most of the objects that a designer will wish to plan may be bounded by lines forming either rectangles, ovals, or triangles, we may solve most of the problems of proportion by properly planning the proportions of simple figures of this kind.

On many objects there are basic dimensions that do not permit a great deal of variation without destroying the utility of the object. This is particularly true of pieces of furniture such as chairs and tables. Most chair seats are from 16 to 18 in. high. These dimensions are more or less fixed and must, therefore, be our point of departure in planning proper proportions. Objects which do not have limiting elements of this kind make the task easier, because they permit the designer more latitude.

Masses with the proportion of 2 to 3, 3 to 5, 5 to 7, or of similar relations, are interesting. Proportions of this kind are beautiful in ovals and triangles as well as in rectangles. Even in cases where the length is exactly twice the width, the relationship is not as interesting as when proportions are used that are more difficult to determine. An equilateral triangle is the least interesting triangle that can be drawn. Pediments for cabinets, highboys, and similar pieces should never be designed in the proportion of an equilateral triangle. If some of these rules were applied in the design of houses, buildings, and to their roofs and other appurtenances more frequently than they now are, what an improvement there would be in the appearance of our towns and cities! There would be fewer houses of the square-box type; there would be improved gables, and an improved skyline.

In planning the major and minor divisions of a piece of furniture, or of any other object, the designer should always try to choose the most subtle relationships possible, consistent with the utility requirements of the object. Where only a single area is to be considered, this will be a simple matter. Most of the difficulties will arise while planning pieces in which there are several areas, some of which may have to be subdivided. Many of the pieces of furniture designed by later eighteenth-century cabinetmakers, especially Sheraton, give evidence that they had mastered the difficulties of proportion. Figure 20 shows a chest of drawers to which particular attention may be directed with profit. The manner in which the minor masses have been handled to improve the proportions of what would under ordinary methods of treatment have resulted in poorly proportioned elements, is worthy of emulation. Instead of long narrow drawers, areas in which the contrast of length to width would have been too great, these have been subdivided to enhance their beauty. This has been done without any sacrifice of utility, such as would have been the case if the drawers had been made smaller to produce the same effect.

To make this discussion as practical as possible, the design of the Spanish Vargueno (Fig. 21), in which the proportions have been worked out very beautifully, is analyzed in Figures 22-A and 22-B. It will be seen by this analysis that experiments with rectangles whose limits will be similar or identical to those of a proposed mass, should result in getting good proportions.

When there is a limiting or fixed element, such as the height of a chair seat, this must be taken as the starting point in working up a design. If it is to be 17 in. high, draw a rectangle 17 in. high at some convenient scale, and experiment with various widths until one is found that is satisfactory. Next, experiments may be tried with the upper part of the chair by extending the vertical lines of the back and stopping them with a horizontal line representing the top of the chair, at an elevation, determined by the judgment of the designer.

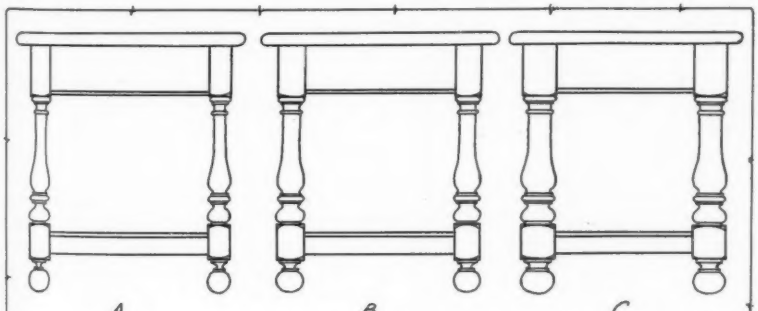


FIG. 23
Stool
PROPER PROPORTIONS MAY BE DETERMINED BY COMPARING SEVERAL SCALE DRAWINGS OF AN OBJECT.

The proper proportions of an object may be finally determined by comparing a number of scale drawings of the mass or object. Figure 23 shows three stools placed side by side for comparison. The stool which we think has the best proportions has been placed in the center, with similar designs having different proportions on either side of it. In this manner it will be possible for the designer to determine the best relations which he is capable of designing. Similar experiments with other objects will be sure to yield results greatly superior to those one gets when working in a haphazard manner.

A great deal of confusion often exists in the mind of the novice when designing a piece of furniture, as to the best method of determining the proportions for legs or similar elements, which will suit the rest of the design. A simple and effective method of procedure for solving such a problem is to make a scale drawing of the proposed object, designing the members in question as heavy or light as the judgment or inclination of the designer suggests. Then to the left of it, draw a similar design, but make the members lighter. To the right, draw a third elevation, and in this make the members heavier. It should now be possible by comparing the drawings, to select the most desirable design, or to make further corrections that will make it entirely satisfactory. This method is shown in Figure 23.

The Project Method in Printing

R. Randolph Karch

Arsenal Junior High School
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A suggestion on the application of this method of teaching in the school printshop.

IT IS hard to determine what has been done in teaching printing by the project method, inasmuch as very little has been published about it in the United States. True, we have projects in our school printshops today in the form of "group" projects such as report cards, office forms, and the like, printed for the board of education. These are a great help in our course, as boys "learn by doing." All of this material, however, cannot be likened to the projects made in metal and woodshops, which, in most instances are made by the boy for himself to take home and enjoy, often for the rest of his life. How much more interesting would a printing course be wherein a boy could print a project born of his own brain — something that he is vitally interested in and could use personally?

The method as outlined in this article aims to give a broader education through printing by using a prepared method of procedure. The aims of this project method in teaching printing are as follows:

1. To provide experiences for junior- and senior-high-school pupils in one of the major industries of the United States. These experiences include the planning and laying out of a printed job, setting it in type, and printing copies of it on a printing press *by every boy* in the class.

2. To train correctly future consumers of printed materials. To teach the value of printing in business and education; to aid him to know the processes involved in any printed piece and to instill in him a knowledge and appreciation of good typography.

3. To aid in the teaching of fundamental processes of education through an interesting creative medium — printing. To teach him to read accurately and understandingly; spell correctly; express himself fluently; and enable him to figure simple arithmetical problems accurately.

4. To provide exploratory and finding values in which the pupil detects his interests and aptitudes. To satisfy the vocational and guidance aims in modern education.

5. To contribute to a better understanding of the proper relationships between employers and employees. To teach the pupil "shop sense" and an insight into the problems the daily worker encounters.

Fig. 1. Boys printing projects in the Arsenal Junior High School, Pittsburgh, Pennsylvania

6. To develop resourcefulness, to aid him in meeting with difficult situations; initiative, to instill energy and develop aptitude; responsibility, to teach the pupil to be answerable in the use of tools and machines; inventiveness, to develop ingeniousness in procedures; and good judgment with respect to his contracts with his fellow workers.

7. To provide a vehicle for worthy use of leisure time, and encourage hobbies, publications, and clubs.

Just what can be suggested in the form of projects in printing for boys? The first thing that comes to most minds is the simplest, the name card. And what can be learned through the lowly name card? At first thought, many will unhesitatingly reply, "Not much!" But if they take time to analyze the project, they will find that it contains much that is of value. Let us outline the project:

A. Layout
   1. Preparing the copy
   2. Sizes of cards
   3. Design
   4. Optical center and balance
   5. Fitting the job in type

6. Making the layout
   a) Display
   b) Harmony
   c) Appropriateness
   d) Choosing the correct type face
   e) Layout procedure

B. Operations
   1. Composition
      a) Setting the stick
      b) Centering the line of type
      c) Justifying the line of type
      d) Removing the line from the stick
      e) Tying up the type form
   2. Pulling a proof
   3. Locking up
   4. Inking the press
   5. Make-ready
      a) Putting on a new tympan sheet
      b) Adjusting the impression
      c) Setting the guides
   6. Feeding the press
   7. Washing the press
   8. Cleaning the type form
   9. Distributing the type

C. Related information
   1. Methods of manufacturing name cards
      a) Letterpress
      b) Copperplate engraving, the processes involved and comparison with other methods
      c) Thermography, the processes involved and comparison with other methods
      d) Lithography, the processes involved and comparison with other methods
   2. Paper stock

D. Judging the job

Questions

1. What copy does the social card usually contain? The business card?
2. What size of card is appropriate for a man? a woman?
3. Where should the main display line of the card be placed?
4. By what three methods are cards manufactured? Which is the most expensive? The least expensive?
5. What weight of cardboard stock is appropriate for cards?

In looking over the foregoing outline, it is apparent what can be learned through even so simple a project as a name card.

Following John Backus' "Social and Educational Objective Chart," which appeared on page 150 of the April, 1934, issue of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION, it will be found that this project, however lowly, brings out the following operations: typography, presswork, binding (if the project is to be padded or stitched), imposition, proofreading, layout, and art. Following his outer circles, showing the academic and social values growing out of these major operations, we find that the card project embraces general educational values, guidance and exploration, self-expression and originality, arithmetic and estimating, good judgment, purposeful and creative achievement, history (classwork), initiative, personality habits (accuracy, neatness and co-operation), preparation for leisure, and applied English (grammar, punctuation, and spelling). These objectives lead us, in turn, to the well-known cardinal aims of education of the N. E. A. Further comment is unnecessary — these means to an end speak for themselves.

Other projects that may be listed are the letterhead, envelope, corner card, invitations and announcements, tickets, book plates, package labels, handbills, greeting cards, posters, programs, menus, membership cards, identification cards, tags, bookmarks, stickers, schedule cards, calendars, and other projects which may be bound or padded in addition to being printed.

The instructor may himself, or through class discussion, rate each finished project. A rating blank similar to the one below may be of value:

Rating Blank

1. *Composition* — kind and size of type..... ——per cent
2. *Art* — color, balance, harmony..... ——per cent
3. *Presswork* — inking, make-ready, feeding..... ——per cent

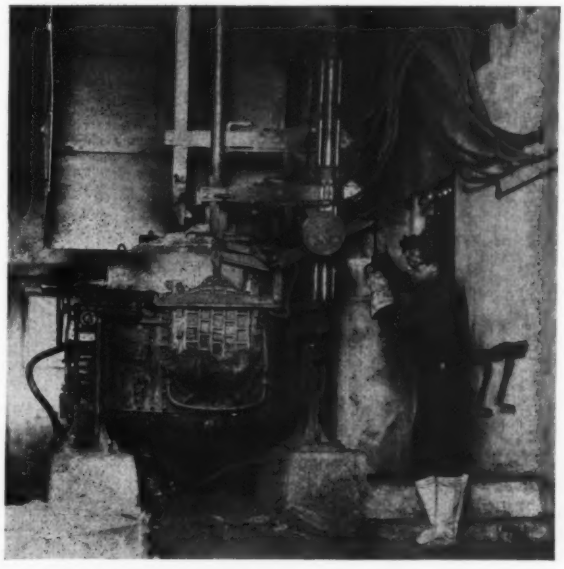
Average ..... ——per cent

And now a word on the administration of the method. It is not the intention that the teacher should presume to direct just what a pupil should print as a project. Rather it is to be understood that projects should be assigned only to start the boy on the idea. Then, as his skill develops, he may select projects for himself. The student interested in philately may design and print special pages for his stamp mountings, or a boy scout may want to prepare for his merit badge in printing, and things of a similar nature. Where the school administration will allow it, the boy should print projects of his own, otherwise much of his interest will be lost.

It is questionable whether beginners be allowed to work under the project method. In the writer's opinion, it is better to allow only pupils who have mastered simple hand composition to study under the new method, unless the classes are small — from 15 to 18 pupils in a class. Where classes are too large, they may be divided into two, or even three groups, and these groups rotate from one type of work to the other.

The problem of presses presents itself. The writer solved this problem by purchasing four small hand-lever presses. Figure 1 shows six boys of the 9A class working on projects — two on power presses and four on hand presses. These small presses, if of the right type, with two rollers and sufficient impressional strength, are valuable in teaching presswork, and quite invaluable in teaching by the project method.

One objection to the project method is that pupils may do printing for outsiders, and thus conflict with the business of local commercial printers. This is no problem in the writer's shop, as any printing for persons other than the pupil himself is definitely barred. As the boys learn the great value of printed materials through printing projects of their own, there can be no criticism on the part of commercial printers, inasmuch as the training of future consumers is a boon to them.



The electric steel furnace, Milwaukee Vocational School

INDUSTRIAL ARTS *and* VOCATIONAL EDUCATION

J. J. Metz, Editor

Humanize Not Mechanize Shop Work

The present trend of increasing the size of the teacher load has introduced a number of new methods all designed to enable the teacher to extend his influence in the school shop without decreasing his efficiency.

Some of the methods introduced seem to work out quite well. The carefully developed plan which enables the teacher to intrust his students with much of the managerial responsibility of the classroom; the detailed outline of instruction which gives direction to the efforts of both student and teacher; the carefully developed instruction sheets which permit the fullest adjustment of subject matter and tempo to individual differences; the progress chart which keeps individual, class, and teacher fully informed of the progress made by the student as a person and as a part of the class; the fully developed system of checking which enables students to assign grades — all of these devices have been developed for but one purpose — to do a better job in the education of the individual.

There is grave danger, however, that with this system highly developed, the well-meaning yet human teacher will in a weak moment take the path of least resistance. With a good set of boys, well trained as assistants, it is very easy to lean back and let the well-oiled machine run itself for a while. But therein lies the danger. Seeing how well the system works without the exacting attention given it in the early stages of its launching, this relaxation may soon become a habit. The boy assistants may still carry on in the prescribed manner, but the master's touch is missing. The system which worked so well when it was first started, begins to behave badly. The students do not seem to be as interested as they were at first. These are danger signals. If they are not heeded, there will be another instructor who claims, "It can't be done."

The trouble, however, does not lie with the system, but with its application. The teacher must not forget that he, not the system, must provide the enthusiasm which incites and activates his students. He is the one who provides the human element that is needed to make the students consciously advance in the right direction. Without this human touch, the system will fail just as a good clock will stop when it is no longer energized by the power that human ingenuity has stored in its driving mechanism.

It must always be remembered that any method used in the classroom must take into consideration that students are not alike; that students work best at those things in which they are interested, but that this interest must be maintained if it is not to flag and finally die; that the teacher, with his enthusiasm, must engender enthusiasm; that merely providing the student with facts stated in cold type is not teaching; that the student, even if provided with an instruction sheet, needs guidance, and that the student cannot be routed through his shopwork as though he were a production job.

Homecraft Industries

During the past few years many of the unemployed have found solace in going back to the handcraft pursuits of their forefathers. Many of these handcraft occupations had practically vanished, because this type of work as practiced in some parts of our country has always meant long hours to the worker.

The younger generation, therefore, found it more to their liking to leave home and go to the more populous centers where they could find employment in factories, working shorter hours and earning better pay. When the work in the cities grew scarcer, many of these workers who had almost forgotten that they ever had skill in a handcraft, went back and revived their love for producing the quaint, beautiful things into which could be worked hours of concentrated effort that would blot out thoughts of the stark realities confronting the jobless.

In some cases it was discovered that, coupled with the pleasure of producing, there also came some monetary returns because there are still many lovers of hand-wrought articles who are willing to pay for them. The big thing, however, is that many workers have regained their love for making things.

It is well that this revival is being seriously studied. The government, for instance, is recognizing the possibility involved in the movement, and the Secretary of the Interior recently appointed a committee which is to make an intensive study of what can be done in devising an arts-and-crafts program which will assist our Indians in reviving the making of some of the things for which the various tribes at one time were famous.

There are many sections of our country where handcrafts flourished in the past. These are being revived now and the school shop can do much toward making this revival worth while. In some of the eastern states, training classes have already been started for upgrading handcrafters. This lead could well be followed elsewhere as it lends itself readily as an addition to the curriculum of any evening school or adult-education scheme. In several states, leagues and guilds have been formed by men engaged in this type of work, and rules and regulations have been adopted relative to membership, standards of workmanship, design, and costs of product.

The school's work with these groups may well be dovetailed into that of upgrading and fostering the ever-growing homecraft movement. The home shop as a hobby cannot be recommended too highly and whether the work done in the home shop is for home consumption or sale is of little moment.

The big thing is that there is an opportunity for the school shop to assist both types of handcraft workers. Are shop teachers the country over ready and willing to shoulder the responsibility?

The Convention Season

The time for the annual meetings of many teacher organizations is not far off. There are a number of these professional and semiprofessional groups that bid for the teacher's time and money. It is at times difficult to decide which organization to join and which to stay away from.

There is, of course, the matter of individual preference, but no teacher can afford not to belong to one or more of these groups which are specially interested in the betterment of educational offerings of the teacher in his own subject, and of the teacher in his teaching position.

In many places, it is obligatory for the teacher to belong to a state teachers' organization. The majority of the members of such an association, of course, are teachers of the so-called academic subjects. The shop teacher, therefore, while he must join as a member, may not find much that will help him in the problems that confront him with his classes, in the general program as set up by the state organization.

For this reason, it is imperative that the shop teachers in the various states get together and form organizations of their own, meeting with the state teachers' organization if necessary, or better still, having a separate convention of their own. There are a number of these state organizations for the teachers of industrial arts and vocational education that are making wonderful professional progress. Their conventions are not held in connection with any other organization; their programs are specifically planned for the shop teacher, and their entire approach is from the shop teacher's angle.

Then there are sectional and national organizations, the special interest of which is to improve the shop teacher himself, the courses which he teaches, and the conditions under which he works. These organizations can accomplish much if they have behind them the weight of numbers, and the financial backing that will enable them to put forward a worth-while program.

The shop teacher who has the interests of himself and of his profession at heart will at once see the necessity of associating himself with his fellows in the working-out of their common problems. It will require the expenditure of some money, but it is a necessary expenditure, and the shop teacher who is in earnest will not fail to be a member of those organizations which are trying to advance the best interests of industrial arts and vocational education.

Training for the Air-Minded

The number of airplanes used in America is steadily increasing. While this means that there must be an ever-increasing number of trained pilots, it also means that there must be a much larger number of trained mechanics to do the servicing and maintenance work on the planes themselves, and to act as attendants, in one capacity or another, on the flying fields and airports that are springing up everywhere because of the demand for them.

Youngsters are naturally much interested in airplanes. Many a high-school lad, as he watches the flight of the mail plane flying high above, determines to be a second "Lindy" some day. Many of these ambitious youngsters will never be able to achieve their ambition to become pilots because of mental or physical defects. Many of them, however, may become valuable men in some one of the many industries involved in the manufacture and maintenance of the airplane.

It is not necessary, then, for the high school to offer courses in airplane flight. That phase of instruction can well be reserved for those full-time vocational schools that want to train pilots. There is room, however, for very much worth-while training that may be embodied legitimately in high-school shopwork that will materially assist the future worker in the aircraft industries. It must be understood, however, that the industry can absorb only a certain number of new workers each year, and that only those who can show definite training for the job can hope to get employment. This means that preliminary training ought to start in the high school or in the full-time vocational school.

In a report on this subject by R. W. Hambrook, of the Federal Office of Education, it is stated that because of the intelligent workmanship required by aircraft workers, the Bureau of Air Commerce of the United States Department of Commerce recommends that an instructor in an aviation-mechanics training course be at least 28 years of age; have a high-school education or its equivalent; have had five years' experience in airplane work, and have a knowledge of the fundamentals of airplane design and construction, of the materials used in building airplanes, and of aerodynamics. In addition, it is recommended that he hold an airplane-mechanic's license from the United States Department of Commerce. Similar recommendations are laid down by the Department of Commerce, also, for instructors of airplane-engine mechanics.

Since, then, future workers who are to render this type of service must be trained, it is well that the school take its duty seriously, and confine its high-school work in this subject to the type of work from which the student can actually gain some benefit. Also, that this work in the high schools be taught by men who have the qualifications required to give the work the prestige which it deserves.

There is no question about the fact that the maintenance of present and future aircraft equipment will require an ever-increasing force of trained men for servicing, repairing, and overhauling flying equipment, and it is proper that the school shop assume its just share of the burden of preparing these workers in the proper way.

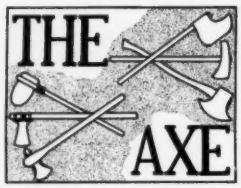
Common Woodworking Tools—II

E. M. Wyatt

West Technical High School, Cleveland, Ohio

This is the second of a series of historical sketches on the development of woodworking tools.

LIKE the knife, adz, chisel, and hoe, the forerunner of the axe was doubtlessly the humble all-purpose stone celt (Fig. 10) — a stone chipped or flaked by primitive man to a sharp-edged disk, and held in the bare of padded hand for all kinds of digging, scraping, and cutting. It became an axe when man learned to affix to it a wooden helve or handle by which he could increase its impact in cutting. We should not overlook in passing that the helve was one of man's greatest inventions. These first stone axes seem crude, rough implements to us, but the primitive men who made them probably considered them quite differently. The helve was a forked, split, or U-bent stick lashed around the stone head with fiber or thongs as shown in Figure 11.



The first step in improving the axe was to peck or grind the stone head into a smoother and sharper implement. In doing so, a shallow groove was made around it to hold the helve securely. Most of them were made with a flat top or hammer poll as shown in Figure 12. Stone axes like this were made by primitive people all over the world. The American Indians were using them when the white man came; the Greeks were using them 900 years before Christ in the days of Homer; the Eskimos are using them today.

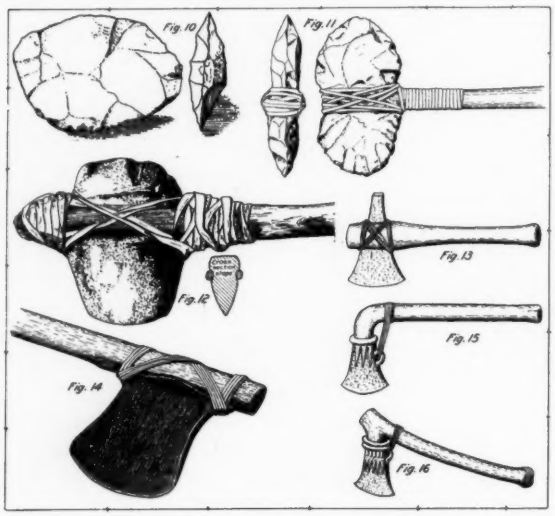


Fig. 10. Flaked stone celt, man's first cutting tool. Fig. 11. Rough stone axe, showing the split helve lashed in place by leather thongs. The thongs were applied wet and when they contracted in drying, held the helve firmly. Fig. 12. Axe of the polished-stone age. Fig. 13. Helved copper-age axe. Fig. 14. Copper axe of the type found in great quantities among the remains of the ancient Egyptians, and also among the South American Peruvians. They were originally beaten out of native copper, though the Egyptians retained the form when they learned to cast bronze and forge iron. Fig. 15. Cast axe of the Bronze Age showing the ornamentation and socket, and the assumed method of helving. Fig. 16. Bronze-age axe showing a more probable method of helving

During the Copper Age, man learned to beat native copper into much the same tool as his ancestors had made of stone. He altered its shape little at first, but helved it as shown in Figure 13. As he learned to depend on copper, he modified its shape and means of fastening it to the helve. The T-shaped axe shown in Figure 14 was developed in widely separated parts

The modern American axe with the proper names of its parts

of the world — Egypt and Peru. In Peru it was always made of copper, but the Egyptians also kept this same form after they learned to cast it of bronze and forge it of iron.

After man learned to cast bronze, the form of the axe was gradually refined. Frequently it was ornamented, and later it

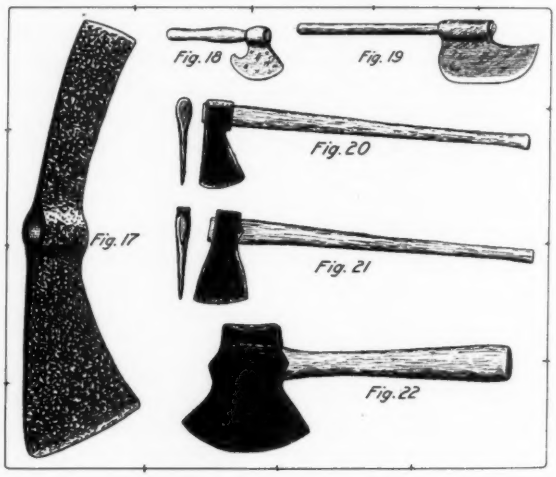


Fig. 17. An ancient Roman iron axe. The eye and double bit are Roman contributions to the axe. Fig. 18. English joiners' hatchet. Redrawn from a picture made in 1678. Fig. 19. Ancient German goose-wing axe. Fig. 20. European trade axe imported into the American Colonies previous to 1740, and typical of the European axe for many hundreds of years previous. Fig. 21. European square-poll axe developed about 1740. Fig. 22. Early nineteenth-century hewing hatchet

was provided with a socket for the helve as shown in Figures 15 and 16. We cannot be sure of how the socket was fastened to the helve, as none of these early axes have been found with the wood helve preserved. They have generally been pictured as helved by a bent piece as shown in Figure 15, but the helve shown in Figure 16 seems more reasonable: it is simpler and would give the tool better balance.

It is strange that going this far, primitive man did not learn to cast a through-eye for the handle, but not one has ever

been found of copper or bronze having that now universal means of fastening the helve.

The Romans did a great deal in developing the axe. They made it of iron and first put an eye through it. They also developed the double-bit type of head, as is shown in Figure 17.

During the Middle Ages, the axe became a famous weapon of war, especially among the Franks. Many beautifully forged examples of battle axes have survived, but these can hardly be considered in a history of tools. The wood-cutting axe lost the double-bit form that the Romans developed, and became a quite unbalanced, often fantastically shaped, tool, of which the English joiner's hatchet and the goose-wing German axe in Figure 18 are fair examples.

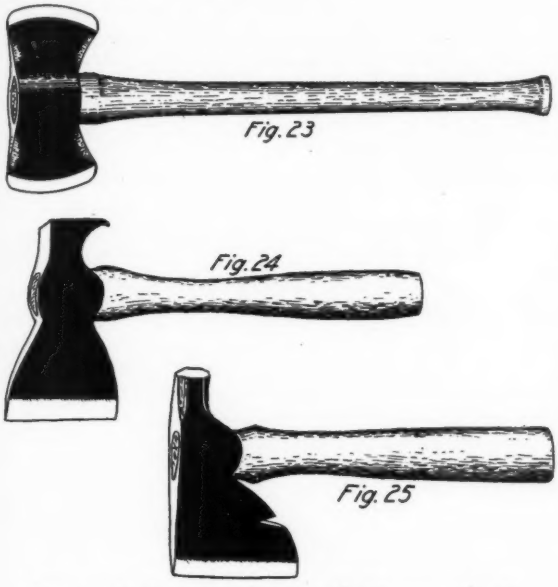


Fig. 23. Modern American double-bit axe. Fig. 24. Modern claw all-purpose hatchet. Fig. 25. Half-hatchet

The first axes used in America were the long-head, rounded-poll, straight-helve type shown in Figure 19. They were made by forging a piece of iron about an iron eye form. Many of these "trade" axes were imported into the colonies for sale to the Indians up until about 1740. It was a form that had existed with little variation in Europe for many hundreds of years. Axes of almost identical pattern have been dug up in the ancient mounds of Ireland where they must have lain for two thousand years. Some of these ancient axes varied in the flare of the blade or other minor details, but none of them in any way resembled the square-poll balanced tool we know today.

The making of the poll square as in Figure 20 was the first important modification of the common axe. This change in the European axe was followed up about the middle of the eighteenth century by American axe makers, enlarging the poll and shortening the blade to make it balance on the helve. This made it a much easier tool to use. By the time of the Revolutionary War, the American axe head was in form practically the single-bit tool we now use. What changes the axe has undergone since, have been largely due to making them by machinery in axe factories. This new way of making them dates from about 1840.

One of the innovations that came with making axes by machinery, was a change in the shape of the helve. In 1853, Mr. Aaron and Mr. Obert Blanchard of Warren, Mass., began making curved axe handles on a new type of lathe that had been developed for turning gunstocks. Before this time the axe helve had been straight like a sledge handle, but with development of the irregular lathe, the new form of helve became as easy to manufacture as the straight one, and now no one would think of using a straight helve on a single-bit axe.

About the time of the change in the axe helve, some daring manufacturer revived the old Roman idea of a double-bit axe. It became quite popular in America, and has been on the market ever since. However, no other country today uses the double-bit axe shown in Figure 23.

The hatchet, like the axe, came out of the middle ages without a poll. When the axe was shortened and balanced with a square poll, it was no longer made with the meat-cleaver appearance of the tool in Figure 18, but was given a broad blade beveled on one side only, suitable for hewing out treenails, and a heavy square poll for driving them. See Figure 22.

In about 1830, sawed lumber came into general use and metal nails began to supersede wooden treenails. This changed the hatchet. The blade became less important and was beveled on both sides for miscellaneous purposes. The poll became shaped for nail driving and some provision was added for pulling nails — either the claw shown in Figure 24 or the notch in the blade, Figure 25.

The most important change in the axe and hatchet of recent years has been to make them entirely of steel. For ages the practice had been to make the main part of the head of iron, and weld the steel bit into a split in the head. This produced an axe that did not break, but it did deform when the poll was used too much, and that lost its ability to hold an edge when the steel bit had been ground away by repeated sharpening. The all-steel axe was put on the market in 1911 by Fayette R. Plumb, Inc. The all-steel hatchet had appeared several years earlier. Now the better axes and hatchets are all steel tools tempered for hard cutting edges and for toughness about the eye.

The axe is one of man's oldest tools; it has gone through a good many steps in its evolution, but its evolution has been an evolution of refinement, not of the principle on which it works. The man who first lashed a stick to a stone celt to ease the blisters on his hands, and then discovered his celt cut faster with its new handle, was the greatest contributor in all history to the evolution of the axe. All improvements since have been but refinements of his invention.

Third-Angle Projection

C. H. Niemann

Technical Vocational High School, Hammond, Indiana

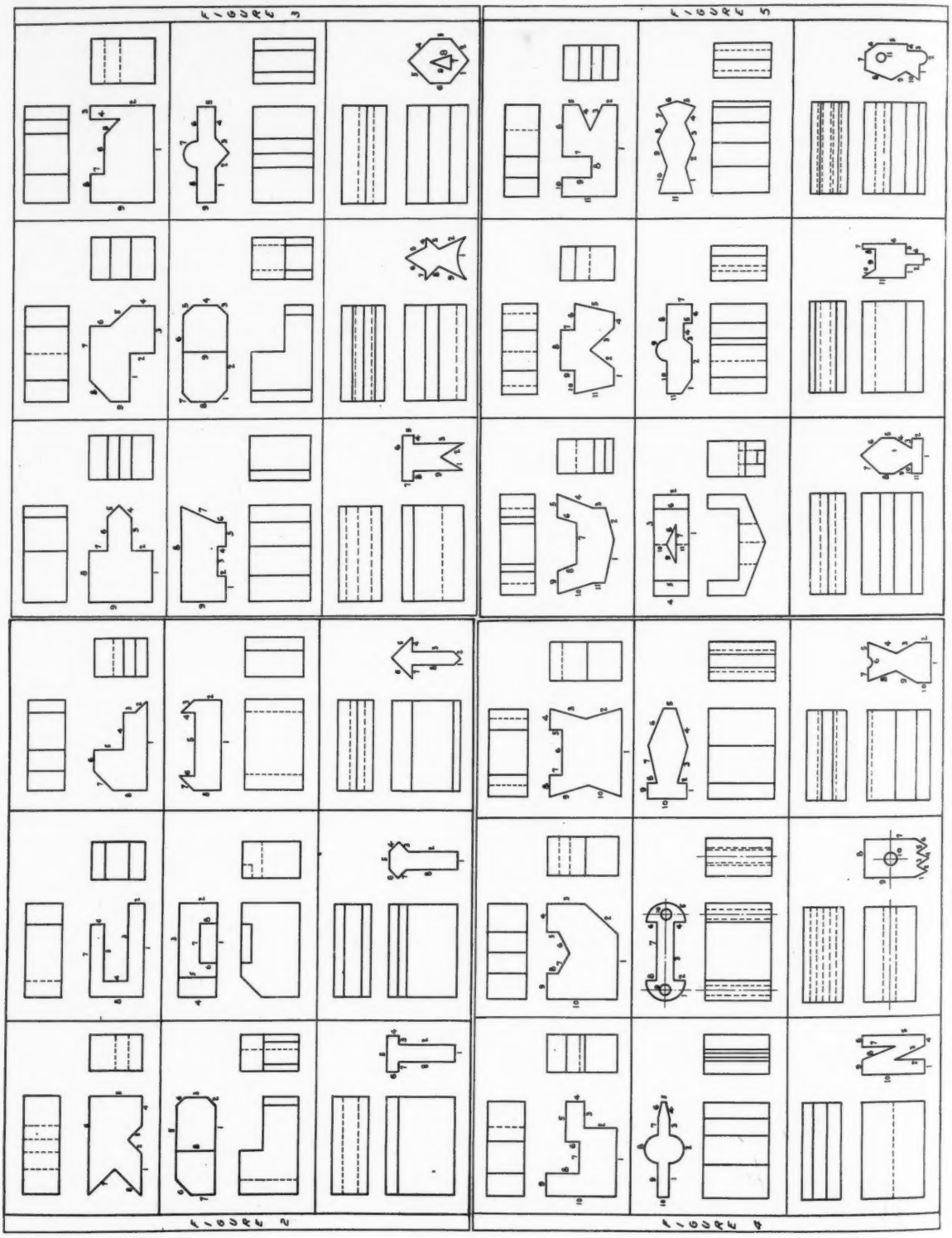
The author describes a worth-while experiment, the results of which may be obtained elsewhere with the same degree of satisfaction.

ANYONE that has ever undertaken to teach three-view drawing or third-angle projection to a group of 9B boys will surely appreciate getting all the help he can in order to put over this important phase of mechanical drawing or blueprint reading. Since a thorough understanding of the proper projection of the views is necessary in order to read a drawing properly, it is very evident that any method used for teaching this must be simple enough for the average student to understand. With this thought in mind, the following experiment was tried out on three groups of 9B students who had never

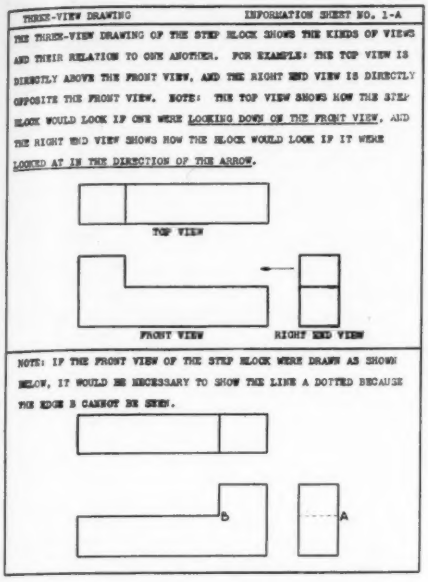
had any contact with the subject of mechanical drawing or blue-print reading. The results obtained were so encouraging that the writer feels it is worth while to pass this method on to others.

The method used is as follows: An information sheet, similar to the one shown in Figure 1, was prepared, showing the three views of a simple object, giving the names of the views, etc. This was also put on the blackboard so that it was always within sight of the class in order that *the positions of the views* would become firmly fixed in their minds. Since the only lines to be used were the visible and invisible object lines, no attention was given to the others, thereby centering all the student's attention on the *drawing of three views and their relation to one another*.

The class was next told to make a drawing of a figure having 8 lines or sides in the front view (see Fig. 2), and then from this view draw a top and right end view. In order to make it easier to check these figures, the class was asked to number



Figures 2, 3, 4, and 5, showing some three-view figures drawn by the students


THREE-VIEW DRAWING INFORMATION SHEET NO. 1-A

THE THREE-VIEW DRAWING OF THE STEP BLOCK SHOWS THE KINDS OF VIEWS AND THEIR RELATION TO ONE ANOTHER. FOR EXAMPLE: THE TOP VIEW IS DIRECTLY ABOVE THE FRONT VIEW, AND THE RIGHT END VIEW IS DIRECTLY OPPOSITE THE FRONT VIEW. NOTE: THE TOP VIEW SHOWS HOW THE STEP BLOCK WOULD LOOK IF ONE WERE LOOKING DOWN ON THE FRONT VIEW, AND THE RIGHT END VIEW SHOWS HOW THE BLOCK WOULD LOOK IF IT WERE LOOKED AT IN THE DIRECTION OF THE ARROW.

TOP VIEW

FRONT VIEW RIGHT END VIEW

NOTE: IF THE FRONT VIEW OF THE STEP BLOCK WERE DRAWN AS SHOWN BELOW, IT WOULD BE NECESSARY TO SHOW THE LINE A DOTTED BECAUSE THE EDGE B CANNOT BE SEEN.

B A

Fig. 1. The information sheet used

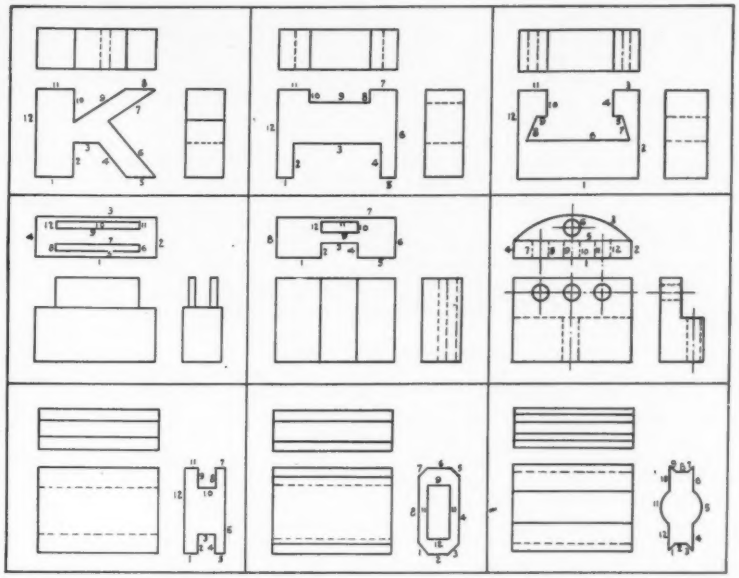


Fig. 6. More examples of drawings devised by the students

the lines or sides in the front view. The drawings were made on theme paper and could be done either free-hand or with any straightedge available.

It was both surprising and interesting to note how many different figures were produced and at such a rate of speed that it was almost impossible to keep up with the checking. In checking over the figures it was also found that the number of errors was very small and would not run more than about 3 per cent.

Having completed the figure with 8 sides in the front view, the next assignment was the drawing of a figure having 9 sides (Fig. 3) or lines in the front view, then 10 sides, etc., up to 12 sides or lines (see Figs. 4 and 5).

This same process was followed in the drawing of the top view first and the right end view first. When all the figures had been checked and sorted, it was found that there was a total of 486 different-shaped figures. Only a few of these are reproduced in Figures 2, 3, 4, 5, and 6, showing the first view that was required to be drawn, with the sides or edges numbered.

Summary: The advantages of this method are: (*a*) The figure drawn is original; (*b*) the figure drawn is at the boy's own level; (*c*) copying is eliminated; (*d*) the student acquires practice in projecting the views from all three positions; (*e*) the entire attention of the student is centered on the correct projection and placing of views; (*f*) the drawing of three views or third-angle projection is acquired in an easy and understandable way.

Aids for the School Shop

Carl v. Lindeman

Paw Paw, Michigan

This list of references to the sources of helpful and suggestive material it is hoped will be found useful by instructors.

(Continued from the October, 1934, issue)

Sources of Materials and Supplies

Archery

Hobby Club Supply Co., Janesville, Wis.
Harry O. Hobson, Lyons, Ore.
Woodcraft Equipment Co., 533 S. Pleasant St., Independence, Mo.

Basketry Supplies — Fiber Cord — Reeds

American Reedcraft Co., 130 Beekman St., New York City.
Milton Bradley Company, Springfield, Mass.
Grand Rapids Fibre Cord Co., 609 Myrtle St., Grand Rapids, Mich.
J. L. Hammett Company, Cambridge, Mass.
Reed Manufacturing Co., Springfield, Ohio.

Carvings — Moldings — Inlays — Borders

Craftsman Wood Service Co., 2735 Mary St., Chicago, Ill.
Dover Inlay Mfg. Co., 150 W. 18th St., New York City.
Klise Mfg. Company, Grand Rapids, Mich.

Craft Supplies

Colonial School & Craft Supply, 608 California St., Newtonville, Mass.
William Dixon, Inc., 34 E. Kinney St., Newark, N. J.
Fellowcrafters, Inc., 18 Beacon St., Boston, Mass.
Metal Crafts Supply Co., Providence, R. I.
J. W. Warnecke Corp., Grand & Second, Hoboken, N. J.

Drafting Materials

Eugene Dietzgen Co., 2425 Sheffield Ave., Chicago, Ill.
Chas. M. Higgins & Co., Inc., 271 Ninth St., Brooklyn, N. Y.
Keuffel & Esser Co., 300 Adams St., Hoboken, N. J.
C. F. Pease Company, 813 N. Franklin St., Chicago, Ill.
Frederick Post Company, Box 803, Chicago, Ill.
U. S. Blue Co., 207 So. Wabash Ave., Chicago, Ill.
F. Weber Co., Inc., 1220 Buttonwood, Philadelphia, Pa.

General Hardware

Lussky, White & Coolidge Co., 69 W. Lake St., Chicago, Ill.
National Lock Co., Rockford, Ill.
O'Brien Lumber Company, 2655 S. Robey St., Chicago, Ill.
Thurston Supply Co., Anoka, Minn.

Handicraft Materials — Castings — Projects and Supplies

Hartley Akin Lumber Co., Cincinnati, Ohio (Cedar chests and supplies)
A. S. Boyle Co., 1934 Dana Ave., Cincinnati, Ohio (Plastic Wood for project repairs)

Casein Mfg. Co., 235 E. 42nd St., New York City (Casein glue)

Ceramic Atelier, 723 S. Kilbourn Ave., Chicago, Ill. (Pottery and modeling clay, tools and supplies)

Chicago Electric Mfg. Co., 2801–35 S. Halstead St., Chicago, Ill. (Electric stoves, flat irons, toasters, etc.)

Designers Company, 724 Munroe Ave., Racine, Wis. (Castings of jig saws, band saws, wood lathes, etc.)

A. J. Fisher, 1002 Etowah Ave., Royal Oak, Mich. (Model ships and fittings)

Ideal Aeroplane and Supply Co., 22 West 19th St., New York City (Model aircraft, historic ship models)

Keystone Glue Co., Williamsport, Pa. (Hide glue)

Magnus Brush Material Co., 604 W. Lake St., Chicago, Ill. (Brush-making supplies)

The Meyercord Co., 133 W. Washington, Chicago, Ill. (Art relief, decalcomania, decorations)

The Pewtercrafters, 29 Meadow, Bronxville, N. Y. (Pewtercraft accessories)

Russell Electric Co., 364 W. Huron St., Chicago, Ill. (Glue pots)

Selley Mfg. Co., 1373 Gates Ave., Brooklyn, N. Y. (Model flying kits, boat parts)

Tri "K" Electric Mfg. Co., 2825 N. Troy, Chicago, Ill. (General electrical supplies, resistance wire, transit bd., enameled wire, etc.)

Elmer A. Wall, 3900 N. Fairfield Ave., Chicago, Ill. (Gas engines for small model aircraft)

Western Stoneware Co., Monmouth, Ill. (Modeling clay)

Leathercraft Supplies

C. W. Dannenhauer, 143 N. Fourth St., Philadelphia, Pa.

W. A. Hall, 250 Devonshire St., Boston 9, Mass.

Lester Griswold, 623 Park Terrace, Colorado Springs, Colo.

Osborn Bros., 223 Jackson Blvd., Chicago, Ill.

Leathercraft Supply Co., Ames Station, Omaha, Nebr.

Wilder & Company, 1038 Crosby St., Chicago, Ill.

Lumber

Algoma Plywood & Veneer Company, Algoma, Wis.

Albert Constantine & Son, Inc., 784 E. 138th St., New York City.

Geo. D. Emery Co., 220—11th Ave., New York City.

T. A. Foley Lumber Co., Paris, Ill.

W. O. King Lumber Co., 2701 S. Damen Street, Chicago, Ill.

O'Brien Lumber Co., 2655 S. Robey St., Chicago, Ill.

Frank Paxton Lumber Co., Kansas City, Kans.

Rice Veneer & Lumber Co., Grand Rapids, Mich.

Underwood Veneer Co., Wausau, Wis.

Upholstering Materials

Lussky, White & Coolidge Co., 69 W. Lake St., Chicago, Ill.

Upholstery Supply Co., 1033 N. Fourth St., Milwaukee, Wis.

Wood-Finishing Supplies

Industrial Arts Service Division, Bruce Publishing Company, Milwaukee, Wis.

Problems and Projects

A NOVEL TURNING PROBLEM

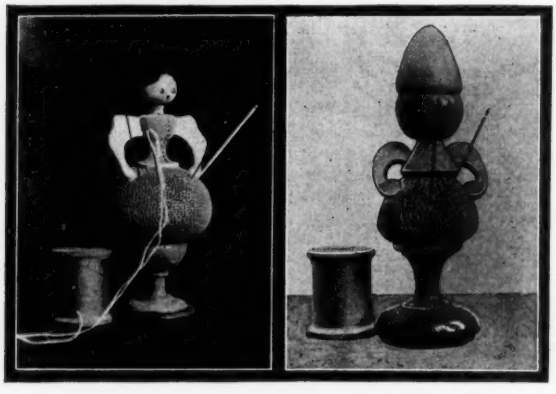
F. Clarke Hughes, John R. Rogers High School, Spokane, Washington

(See Supplement No. 299)

The little figures that are shown and described in this article, are very well suited to the junior high school where a course in elementary wood turning is offered. The principles involved in the making of these little pincushions are very similar to those found in most elementary or intermediate courses, and might well be used as optional or additional models. Problems such as these have a strong appeal to most boys, and the motivating influence will do much to encourage good workmanship and a wholesome respect for the course.

Because these projects are planned to be used as pincushions, the middle sections are constructed of balsa wood so that pins may be stuck into the body, but if the balsa wood is not available or the solid wood is preferred, the whole may be constructed from one piece of soft pine. The balsa wood may be obtained at many of the toy shops today, as it is used extensively in the construction of model airplanes.

As the two figures are so nearly the same, and may be made either singly or in pairs, the following instructions will be given in the singular and may be considered as applicable to both sets of drawings.



The turning project becomes a novel pincushion

The stock for the main portion of the figure should be a piece of soft pine or other suitable wood 2 by 2 by 4½ in. turned to the shape and size shown in the details. The part to be filled with the balsa wood should be left in the form of a ½-in. spindle, and the balsa wood fitted and glued snuggly onto this ½-in. spindle in two halves and allowed to dry.

The assembled parts are then replaced in the lathe and finished in the usual way with tools and sandpaper. A little care will need to be used in turning the balsa because its softness requires exceedingly sharp tools.

The arms and nose are cut from thin wood and glued into place. It is suggested that the arms be cut from a thicker piece of stock and then split or divided to make the thinner parts. This will give uniformity of shape.

If the base is weighted with a little lead, the figure will be more stable and less easily knocked over when in use as a cushion.

The finish should be two or more coats of lacquer or enamel in bright clear colors such as those suggested. A bit of green felt glued to the finished base will also help to produce an attractive finish.

PORTABLE DRAWING BOARD

D. W. Brown, East High School, Wichita, Kansas

(See Supplement No. 300)

The drawing board illustrated and described herewith, makes it easy for the student, who is ambitious enough, to do some of his drawing outside of class. Cleats on one side of the drawing board hold the necessary scale, irregular curve, and T square. When the T square is withdrawn, the other instruments are released. Near one edge of the drawing board a hand hold permits it to be carried easily.

A FOLDING CAKE TIN

Harry W. Kroll, Buhl, Minnesota

General Directions

1. Study the drawing to understand the construction of the project.

2. Read the job sheet carefully and make a list of the steps in the order of procedure and new operations involved on the project-analysis sheet.

3. Watch demonstrations carefully. Ask questions if in doubt about the construction of any part of this project.

4. Be careful when working with tin plate not to scratch the surface unnecessarily.

5. Cut out all the separate pieces, including wire, required for the project.

Material

IXX Charcoal tin plate, and 12- and 10-gauge coppered wire.

Procedure

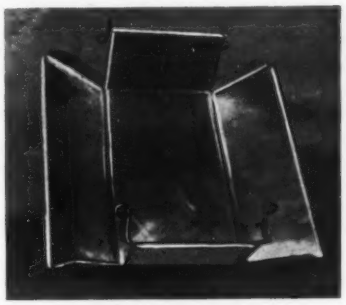
Bottom Ends

1. Fold over the ⅜-in. allowance on the bottom edges of this piece of No. 10 wire.

2. This material turned over on the edges of both ends, must be bent down to form a single hem.

3. Fold the allowance, which is the upper edge of the pan ends for No. 12 wire. This fold is turned on the same side as the ¼-in. hem.

4. Insert No. 10 wire on the edges of the bottom and complete on wiring machine. Withdraw the No. 10 wire, leaving the edges open as shown in Figure 1.



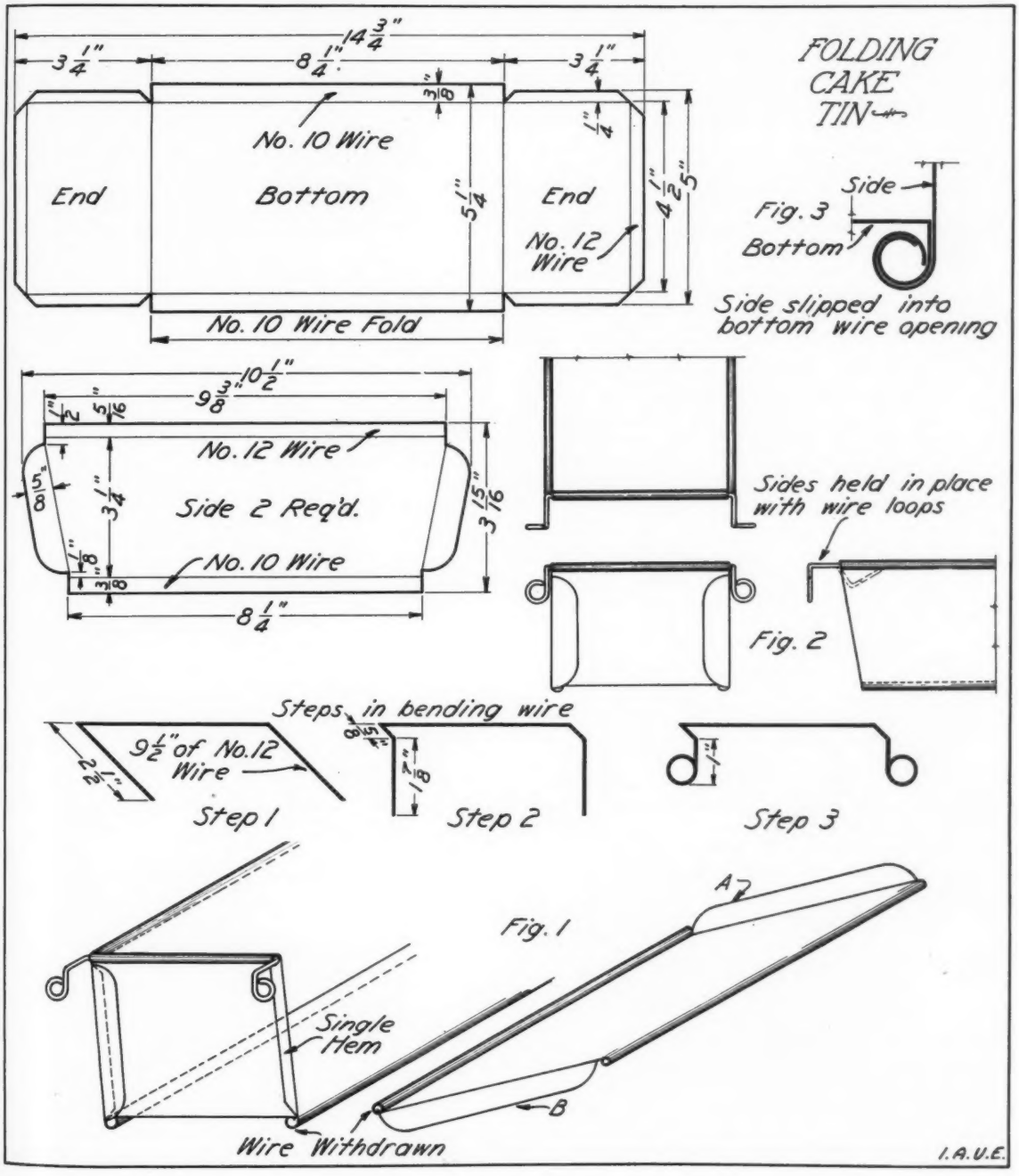
Folding Cake Tin

5. Have the work checked for the folding.

Sides

1. Turn over the required material for No. 12 wire on the upper edge of pan side.

2. Turn over the bottom edge for No. 10 wire. Turn this in the opposite direction from the fold on the upper edge.



3. Bend the lap A in Figure 1 to a right angle with its side.
4. Have the work checked by the instructor.

Wire loops

1. Bend the No. 12 wire to the shape shown in "Steps in bending wire." Bend this wire in the vise, but do not leave any hammer marks.

Assembly

1. Slip the side into the bottom as shown in Figure 1. Adjust the two open joints so side will bend up accurately.
2. Slip the wire into the wire opening of pan ends and bend the tin over the wire as shown.
3. Bend the loop against the pan sides to hold tightly.
4. Bend last lap B in place and adjust wire loops against the pan sides (see Fig. 2).
5. Pan sides should be held tight enough when wire loops are in place, to hold cake batter in pan.
6. File all sharp corners and clean with steel wool.
7. Have the instructor give the work a final inspection.

THE TOBOGGAN

U. L. Hiatt, La Junta, Colorado

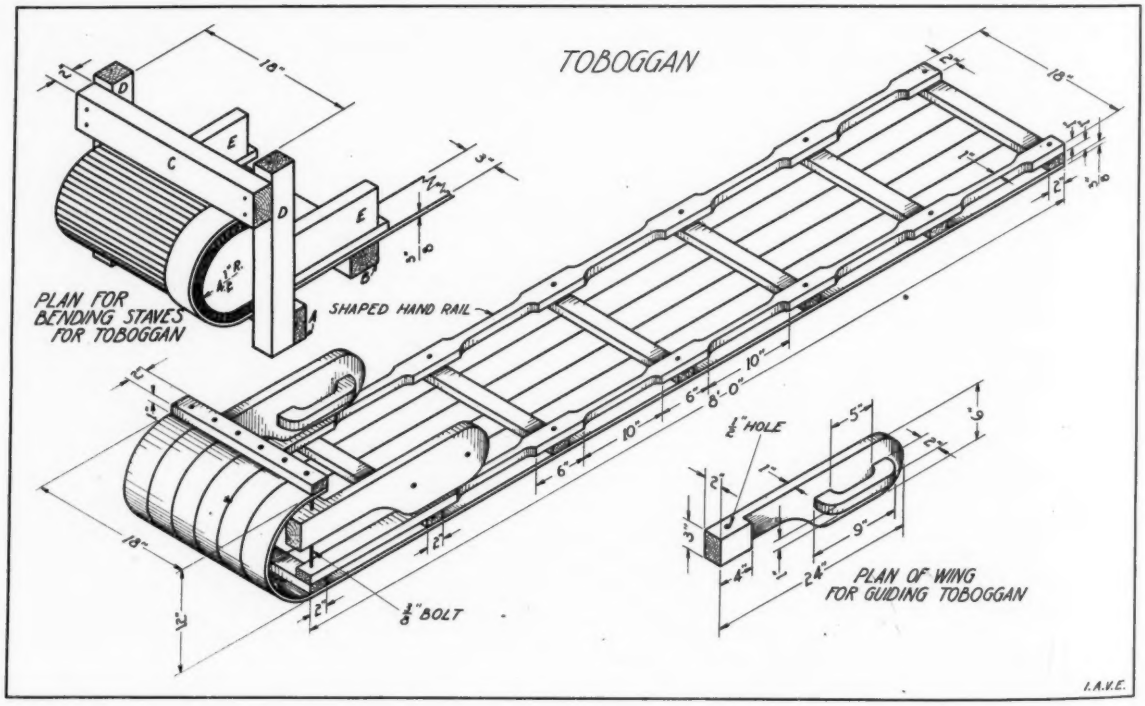
When winter settles down upon us with her icy grip and spreads her mantle of snow over hill and dale, it is then time to enjoy the thrills provided by nature. One of the greatest of these is a toboggan ride down a long steep hill, and the subsequent swoop out onto the flat or field at the foot of the hill. Stones, bushes, trees, or even wind-blown bare spots are to be avoided on that quick run down the hill. I say "quick run" advisedly because a properly treated toboggan will run. The best treatment after the staves have been oiled with one coat of boiled linseed oil is to "tallow" them. This is properly done by using a tallow candle and a heated flatiron. Better yet if you can secure a tailor's "goose." Give the bottom side of the toboggan a good film of tallow by ironing it with the hot flatiron.

The illustration shows a "wing" for guiding the toboggan. The driver sits tailor-fashion, close enough to the front so that his hands may grasp the hand-holds on the inside of the wing. When loaded, the toboggan is given a push and away it goes. Trees and rocks are easily avoided by gently dipping the wing in the snow. The right wing guides the toboggan to the left and the left wing guides it to the right. This enables the driver to choose his course and to guide the toboggan to the longest possible run on the hill.

The making of a toboggan is not a difficult task and would present a fine shop project for a class. Only two extra pieces of fine equipment are necessary: one, the form for bending the staves properly; the other, a vessel to hold the ends of the staves while they are being boiled. This may easily be made in the sheet-metal department, or at a tinshop in town. This vessel should be 4 by 6 by 30 in., with a bottom soldered on, and a grate to keep the ends of the staves off the bottom. A few pieces of ½-in. gas pipe wired together would make a fine grate. Place ½-in. strips between the staves in two places, at one end and about 3 ft. from the end to be bent, and securely clamp in place. Next fill the vessel about one third full of water and place on the heater (would suggest electric plate). Place the bundle of staves into the water and pack around them and the top of the vessel with burlap or waste packing. The boiling is a very important part in making the staves, so be certain that the staves are thoroughly boiled for eight or ten hours. You should have no trouble in bending a thoroughly boiled stave. Remember, a cracked stave is worthless and must not be used. You must have the bending form the size of the inside measurement of the stave curl. The staves should be clamped securely to the frame and placed in a warm place to dry for 48 hours. The staves should be oak, ash, or hickory and should be ⅜ or ½ in. thick. The thinner stave is strong enough and really better, as it is lighter and faster on the run.

While the staves are drying, the wings may be worked out according to the dimensions given in the drawing. Notice that the hole is made ½ in. in diameter while the bolt is only ⅜ in. This makes the motion of the wing very free. The cleats should be of oak, ash, or hickory, cut to the given dimensions. The handrail is shaped as designed in the drawing so that it may be grasped easily and firmly. The staves should be screwed to the cleats with No. 10 — 1-in. f.h.b. screws, well countersunk. Use a ¼ by 2½-in. carriage bolt to secure the handrail. To keep the wings in place, use a ⅜ by 12-in. carriage bolt. This will pull the curve of the staves down slightly, but will give added rigidity.

To finish, sand the staves with No. ½ sandpaper, and rub in a coat of hot, boiled linseed oil. Allow this to dry 24 hours, and tallow evenly with a tallow candle and a hot flatiron.



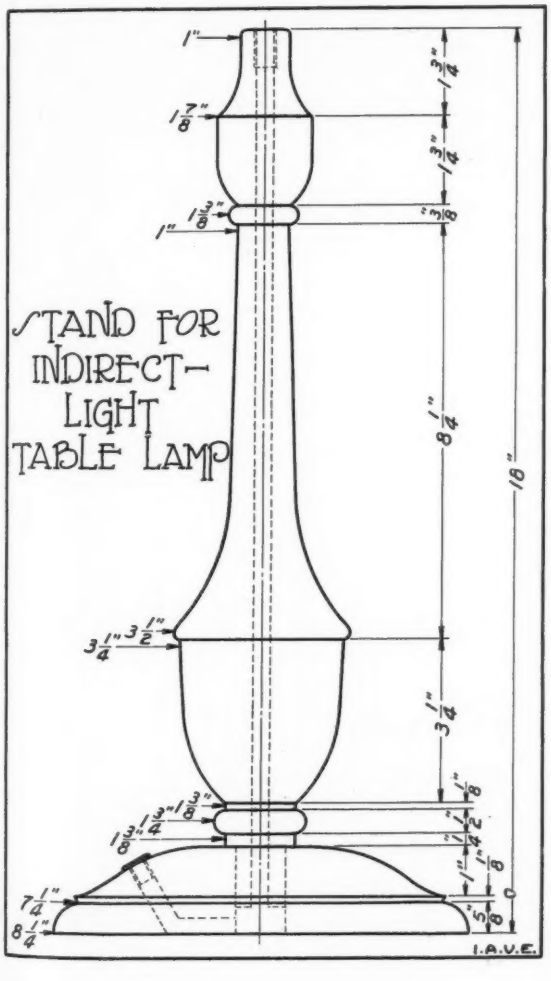
The thrill of one good ride will repay you for all the work on the toboggan. To the driver try a quick turn at full speed. A nice spill in the snow is as much fun as a good long run.

INDIRECT-LIGHT TABLE LAMP

Thomas L. Hutchinson, Dansville Central High School, Dansville, New York

The base for the indirect-light table lamp shown herewith is turned out of walnut. An aluminum reflector may be purchased in almost any department store or dealer of electrical lighting equipment. Now and then one may be salvaged from a medical heating lamp. A 75- or 100-watt lamp usually will be found sufficient for studying, reading, sewing, or playing cards.

The indirect-light table lamp with and without shade



The socket is attached with a ⅛-in. pipe nipple screwed into the wood top for a distance of about 1½ in. The reflector and the socket are then put on in the conventional manner.

An ordinary shade put on this lamp takes away the unorthodox appearance which it would have without the shade.

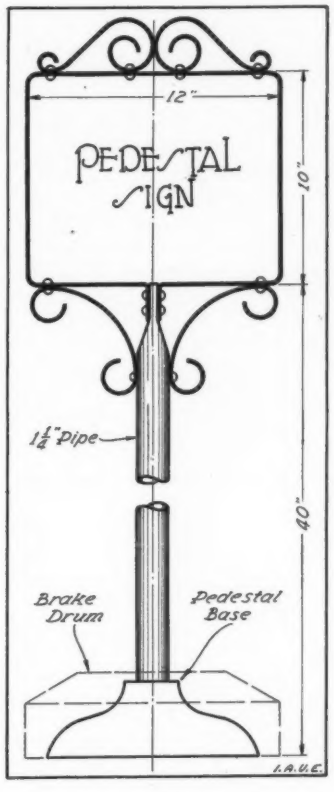
PEDESTAL SIGN

Alfred B. Grayshon, Olney High School, Philadelphia, Pennsylvania

Signs are conveniences needed in any school building. The accompanying illustration shows a pedestal-type sign that can be made readily in the school metal shop.

The base is either a discarded brake drum of an automobile or a pedestal such as used for domestic boilers.

The standard is made of 1¼-in. pipe threaded at one end. The other end is flattened by heating and beating flat with a sledge or heavy hammer. If the pedestal base is used, the pipe should be 36 in. long and screwed into it, while if a brake drum is used, a ¼-in. hole should be drilled in one end of a 40-in. long pipe in place of threads, a rod run through the hole and concrete poured into the drum around the pipe. In the latter case, prop the pipe vertically until the concrete sets.



The frame is made of a piece of scrap iron ⅛ by ¾ by 49 in. bent into the shape shown with 2½ in. on each end to be drilled and fastened to the flattened end of the pipe standard with ¼-in. round-head screws.

The scrolls on the top of the frame are made of ⅛ by ¾ by 15 in. strap iron, bent as shown and riveted in place.

The bottom braces make the frame more rigid and are made of ⅛ by ¾ by 13 in. bent to the desired shape. The top end is riveted to the frame while the bottom end is fastened to the standard with No. 10–24 screws.

The sign plate is made of No. 24-gauge 11 by 12-in. sheet iron. A ½-in. right-angle bend is made on each edge of the 11-in. width, providing two 5/32-in. holes in each for fastening to the frame with 8-32 screws.

The whole assembly may be enameled black, and the desired lettering done with white enamel.

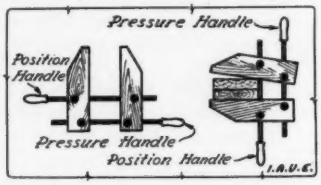
AN EFFICIENT METHOD OF USING HANDSCREW CLAMPS

Tom S. Jenkins, Oakes, North Dakota

The *approximate opening* of a handscrew clamp should be secured by revolving the jaws of the clamp while holding the handles firmly. By grasping the handle which is at the end of the clamp (pressure handle) with the right hand and the center handle (position handle) with the left hand, the direction of the rotation for opening the clamp is always the same,

and likewise the direction for closing the clamp remains the same.

Having secured the desired opening, place the clamp so that the center spindle (position handle) is as close to the stock as



possible. Then adjust the clamp so that it grips the edge of the stock which is nearest to this spindle, while the points of the jaws are slightly open.

Now, by turning the handle which is at the end of the clamp (pressure handle) to the right, the desired pressure may be secured.

Adjust all clamps to the *approximate opening* before the glue is applied when gluing up stock which requires the use of more than one clamp. In placing the clamps on the stock the direction of the jaws should alternate.

PAGES FROM A MUSEUM SKETCHBOOK

Burl N. Osburn, State Teachers College,
Millersville, Pennsylvania

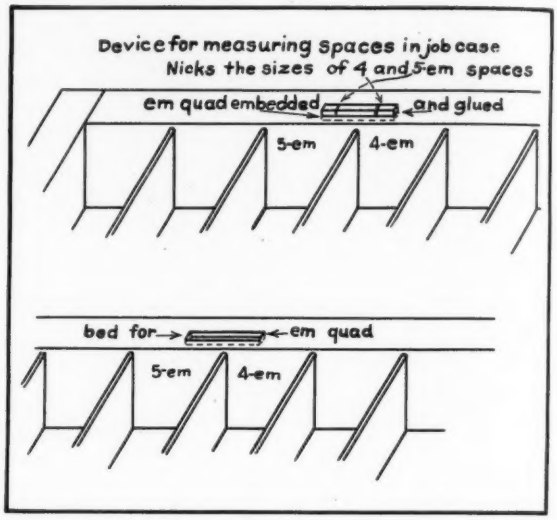
The Pewter Ladle

The pewter ladle shown in the accompanying sketch is one of the many beautiful pieces in the collection of the late Dr. Mercer. The bowl and handle are made separately and soldered together. The metal handle is hexagonal in section and has been planned to bring the wide face in view at the same time the diameter of the bowl is seen, while the narrow view of the handle shows with the height of the bowl, thus keeping a harmonious proportion between them. The wooden handle, which is turned of ebony or some dark wood, is held in the metal part by a pin. The bowl may be hammered or spun quite easily, while the handle may be cast in plaster or jeweler's sand.

SPACE DISTINGUISHER FOR THE PRINTING STUDENT

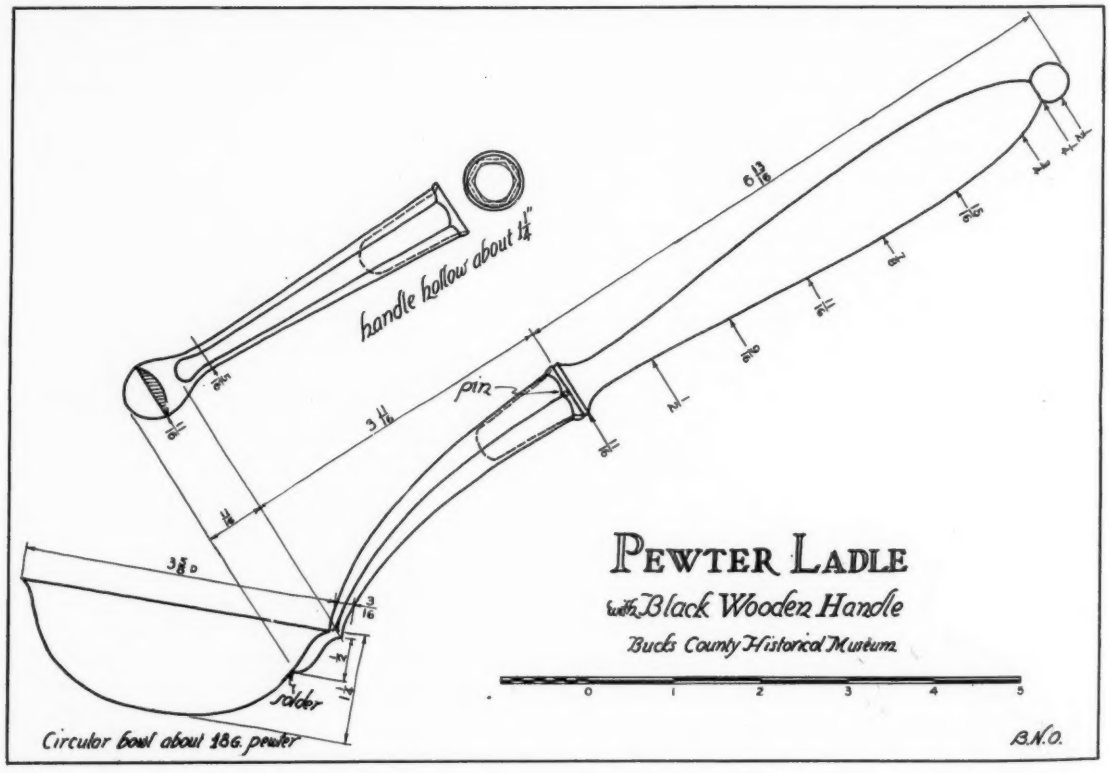
W. Harry Phipps, Chancellor Avenue Junior High School,
Irvington, New Jersey

In elementary- and junior-high-school printshops, one of the greatest obstacles to master is the distinguishing of small spaces. Even though the boys try, some cannot keep the differ-



ent sizes separate because their eyes are not yet mechanically trained. Samples of the spaces have been glued to the boxes they are to occupy, but sooner or later they are broken off.

By cutting a nick, the thickness of a 5-em space, on one end of an em quad, and one the thickness of a 4-em space on the



other end, and sinking this quad into the top of the case between two space boxes, the trouble is all settled. The space for the em quad may be cut as a mortise. Then the quad is firmly glued in place, leaving about half of it above the surface with the space nicks. The boys can test all uncertain spaces with these guides. If difficulty is also found with the 3-em spaces, an em quad with a 3-em-space nick may be embedded at the side of the space box.

TYPEWRITER TABLE

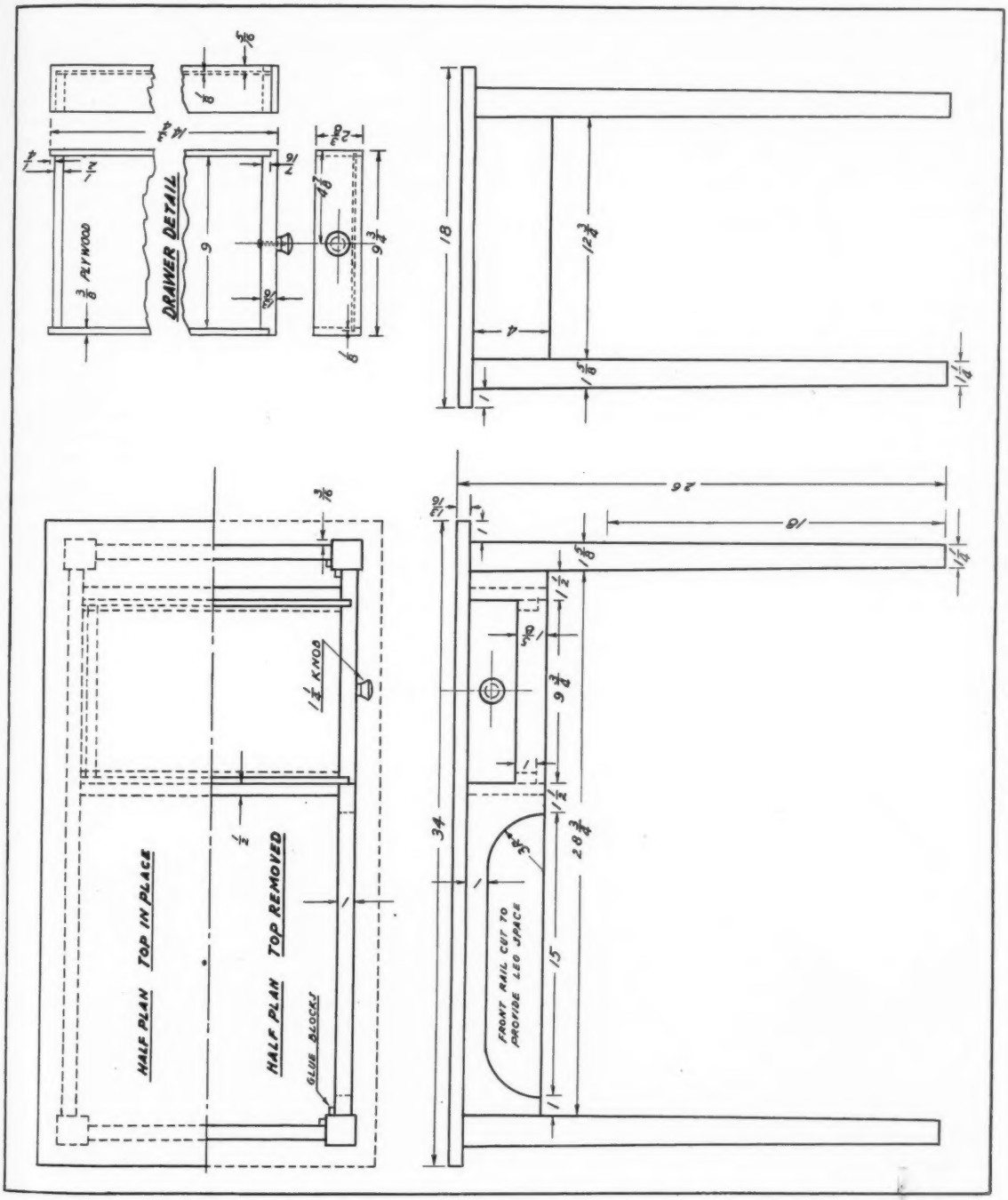
James R. McDonough, McKinley Senior High School, Honolulu, Hawaii

The typewriter table shown in the accompanying illustration was originally designed to provide an inexpensive table for the commercial department of the school. The table proved to be very satisfactory, and it was found that many students taking shopwork desired to build a similar table for use in their homes.

The table is simple to construct and it makes a practical problem for the junior- or senior-high-school woodworking class, either on a factory production basis or as an individual project.

If a number of tables are to be made on a production basis, the instructor should divide the class into groups of five or six, and designate one boy in each group to act as foreman. Each group should then be assigned some specific job such as laying out and gluing up the tops.

One boy in each class may be selected to act as superintend-



Typewriter table submitted by James R. McDonough

ent, to assist the instructor in co-ordinating the work which is being carried on under the direction of the foreman. This method of instruction will give the boys excellent training in group co-operation, as well as an insight of actual trade practice.

If the table is to be built as an individual project, it may be well to adopt the following sequence of jobs.

The top should be glued, the excess glue being wiped off with a damp cloth, and set away to dry.

The rails and legs may then be made, and the blind mortise-and-tenon joints laid out and cut.

The ends, composed of the legs and side rails, can then be glued. While the glue is drying, the drawers may be made and glued.

Then the ends and the front and back rails should be glued While the glue on this job is drying, the top should be prepared for fastening to the rails.

The drawer should then be cleaned and fitted, and the handle put on.

The table is then ready to be cleaned and sandpapered for finishing.

In the finishing of the table, the student is given the opportunity to use originality. Many attractive lacquer-finished tables were made according to these plans. If a paint spray is available, a pleasing mottled lacquer finish may be applied.

Bill of Material

1 pc.	¾ x 18	x 34	Top
4 pc.	1 5/8 x	1 5/8 x 25¼	Legs
2 pc.	¾ x 4	x 28¾	Rails
2 pc.	¾ x 4	x 12¾	End rails
2 pc.	½ x 4	x 14	Partitions
	For Drawer		
1 pc.	¾ x 2⅜	x 9¾	Front
2 pc.	⅜ x 2⅜	x 14¾	Sides (plywood)
1 pc.	3/16 x 9¼	x 14¼	Bottom (drawer-bottom stock)
1 1¼" Knob			

FIRESIDE WOOD BASKETS

Floyd D. King, Phoenix, Arizona

Nothing adds more to the appearance of any fireplace than a well-made wood basket of hammered iron. The wood baskets described herewith offer a variety in design and will not be found difficult projects to construct. An attractive feature of these baskets is the inexpensiveness of the materials used.

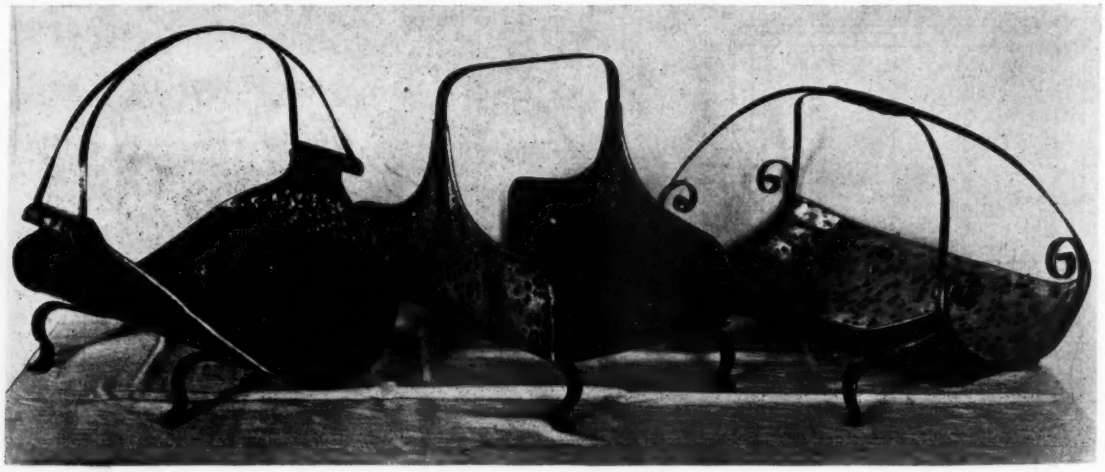
All three of the designs shown may be made of 24-gauge black iron. For the feet, use ⅛ by ¾-in. strap iron. The 9-gauge wire on the edges will add to the strength of the baskets.

In Figure 1, the pattern may be laid out on the iron, allowing ½ in. between the points AB and CD for the wire edge. If only hand tools are available for turning the edges, a pair of pliers will serve the purpose. After this has been completed, hammer the iron with a ball-peen hammer with the wire edge down. Forming the body into shape may be done by hammering the iron while the scroll end is slightly raised. The scrolls may be bent with pliers or formed over a piece of wrought-iron pipe or over a piece of ¾-in. strap iron, ⅛ by ¾ by 20 in. for the feet. Hammer the extreme ends until they flare slightly and then bend the metal to fit the body, allowing the basket to stand 2 in. from the floor. Drill three holes 3 in. apart for riveting the feet and body together. The handle is made of two pieces of strap iron, ⅛ by ⅜ by 24 in. held together by means of 4 pieces of 24-gauge ½ by 1½-in. black iron. Bend these pieces which form bands around the handle by means of pliers and hammer. The extreme ends of the handle are bent to a 90-deg. angle and in such a position as to enable them to fit into the scrolls.

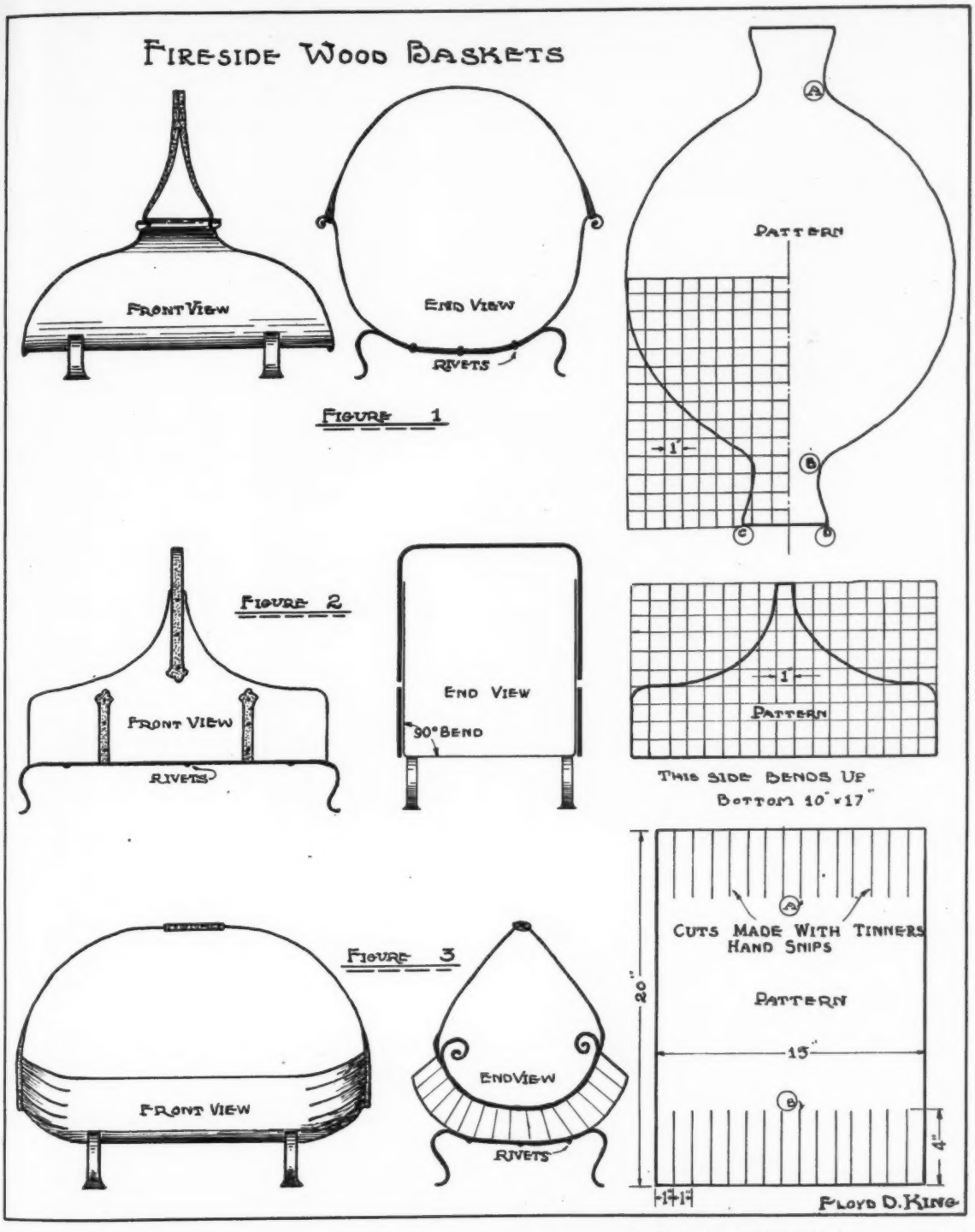
Figure 2 has the wire edge on all sides except for the extreme ends where the handle is to be fastened. After the wire edge is made, the basket may be bent into shape and then hammered so that the impressions made by the ball-peen hammer will come on the upper side at the bottom, and on the outside of the sides when bent upward. For the handle, one piece of strap iron ⅛ by ¾ by 24-in. will allow enough to overlap on the sides and form an effective design. The extreme ends may be hammered and formed into any shape desired. Fasten the handle to the body by means of rivets. The pieces on the sides of this basket are for ornament only, and may also be designed to suit individual tastes. The pieces shown in the illustration are ⅛ by ¾ by 4½ in. They also are fastened to the body with rivets. The legs are of ⅛ by ¾ by 23-in. strap iron, and should be bent so as to allow the basket to stand 2½ in. above the floor.

In Figure 3, the cuts in both ends of the body are 1 in. apart and 4 in. long, which will allow the material to overlap ⅜ in. at each cut. These should be riveted with No. 1 rivets and hammered as flat as possible so that the handle and scroll may fit closely together. Two pieces of ⅛ by ½ by 40-in. strap iron form the handle which is brought together in the center and held by means of a piece of 24 gauge, 1½ by 5-in. black iron which is shaped to fit the handle and hides the loose ends. This piece should be hammer-marked with the ball-peen hammer before it is fastened into place. The scrolls on either end are made of ⅛ by ½ by 26-in. strap iron. The scroll, body, and handle are joined together by three long rivets. The feet are made of two pieces of ⅛ by ¾ by 18-in. strap iron, bent to fit the body.

In order to bring out the contrast of black and white in the hammered iron, sandpaper the metal until a brilliant luster is secured on the high spots. A thin coat of white shellac, or clear lacquer will preserve the finish.



Fireside wood baskets



JIG FOR ROUNDING BLOTTER HOLDER

Andrew Bosma, Linwood, Massachusetts

The fixture described in this article, is used to give the bottom portion of a blotter holder a rounded effect. It is made of hard wood, a small piece of steel, a short piece of iron rod, and a portion of an old hand screw. The piece of steel is used to make two jaws, one of which is fastened to the separator as shown, while the other is screwed to the block which holds the hand screw. Care must be taken when placing these jaws that clearance is left for the jointer knives to pass.

A small step should be left under each jaw to prevent it from going into the blotter-holder ends too deep.

The frame, which includes two concave sides held apart near the ends by small pieces of wood, acts as a track for the convex sides. These convex sides are fastened securely to the separator by means of screws.

To install this fixture, the frame is clamped to the jointer table at a 10-deg. angle which insures better cutting. This does not noticeably interfere with uniform thickness at corners of the blotter holder.

When ready to use, a block is placed between the jaws and

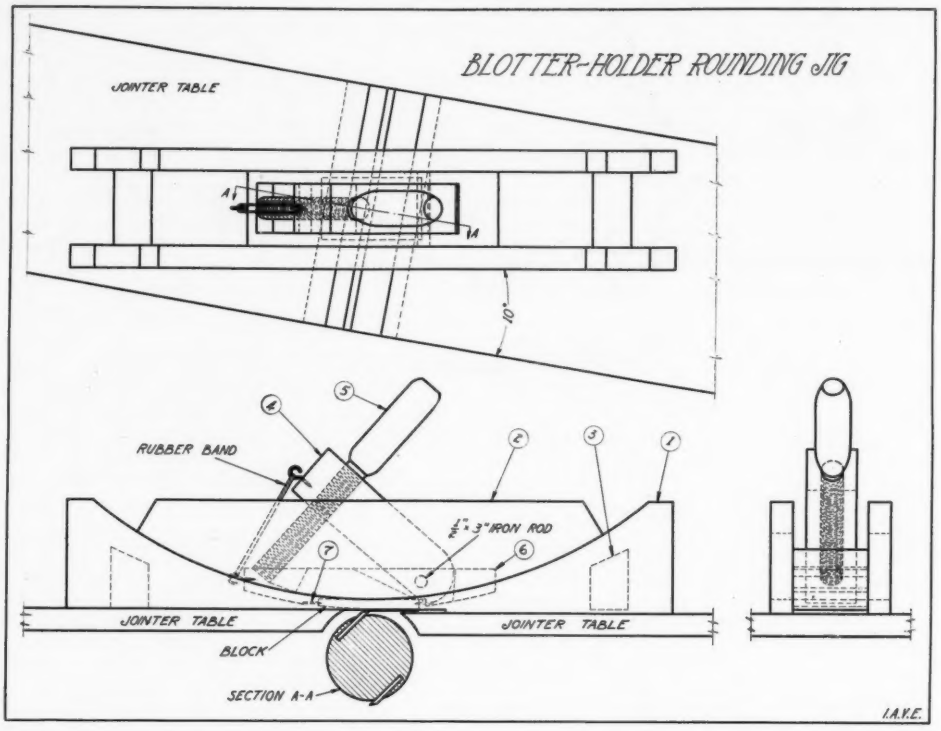
clamped tight by means of the hand screw and pushed over the frame slowly with a rocking motion.

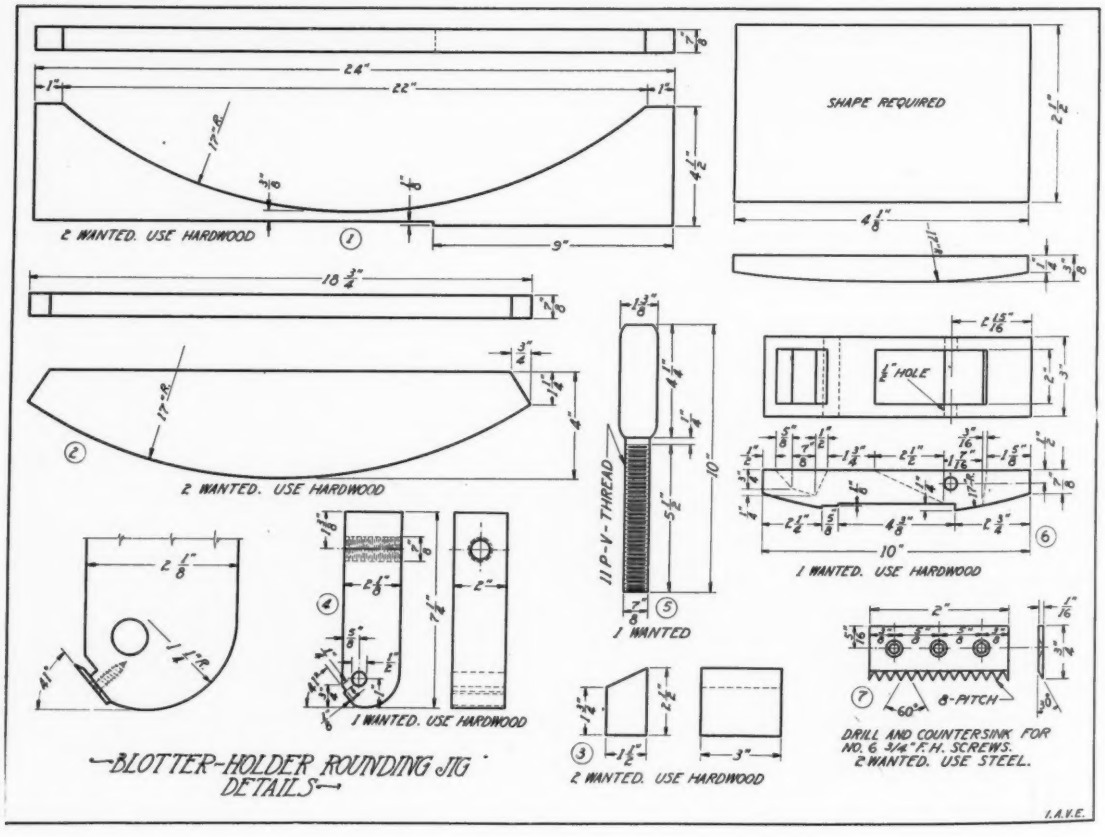
This fixture may be made to give the blotter-holder portion more of a rounding by changing the radius of the concave and convex portions of the jig.

A STAGE SETTING

A. W. Bondurant, Madison, South Dakota

The stage setting shown, with the exception of the back drop and two side wings, was made in the industrial-arts department of the city schools, Madison, South Dakota. It was





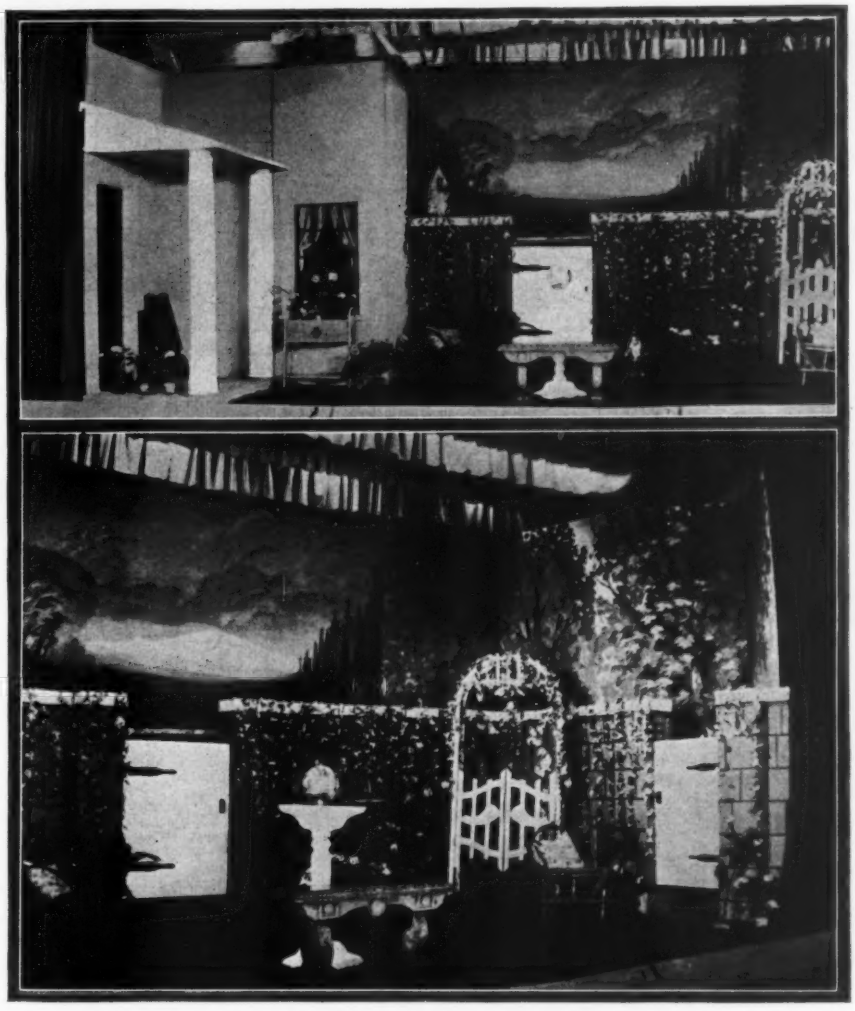
used for a school play entitled "The Garden of the Moon."

The house was covered with wall board in place of cloth. The window and the door were set in frames with casings, sills, etc., just as in a real house. Instead of painting, the house was stuccoed with muresco mixed with wood fiber to which a small amount of waterproof glue was added. The frames of the door and the window were murescoed in white. The roof of the house was made of wall board painted red, the shingles being shown with black lines. For the valley and hip coverings, cream drawing paper was used. The porch had real pillars. The roof was made of wall board, and the ceiling of a large piece of unpainted plywood.

The stone wall consisted of a wooden frame with a muslin covering. After the entire wall had first been murescoed the color of the stones, mortar lines were put in with a paint made of thin waterproof glue and lampblack. The coping on top of the wall was murescoed white. The two gates were made of wall board, the hinges and cracks in the boards being shown in black.

The pergola was built of wood and painted white. After it had served its purpose on the stage, it was sold to a private family. The pedestal was a bird bath made by the eighth-grade class in concrete. The bench in front of it was a wooden one painted to look like marble. The flowers on the wall were made in the art classes.

The whole setting did not cost a great deal, and mostly all of it is so built that it may be used for other plays.



Stage setting made by industrial-arts students. A. W. Bondurant, instructor

ONE-TWELFTH H.P., 110-VOLT UNIVERSAL MOTOR

Walter B. Ford, Eagle Rock High School, Los Angeles, California

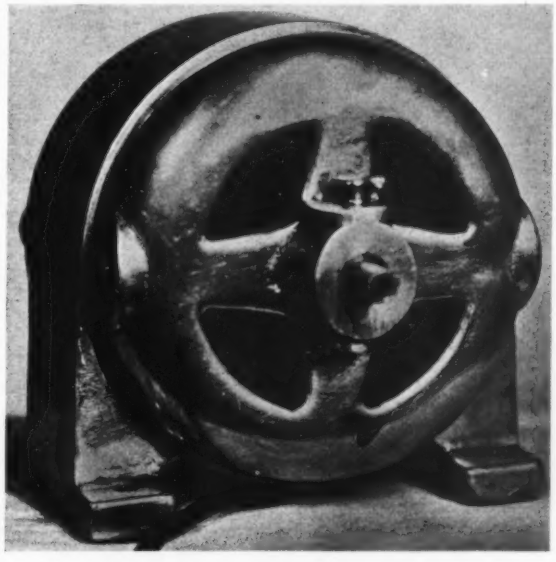
The motor described in this article was designed to meet the needs of advanced students in electric-shop classes.

The motor will develop about 1/12 h.p., and has a speed of 7,000 to 10,000 r.p.m. It will run for long periods without undue heating or bearing wear, making it ideal for running fans, grinders, or other small equipment usually found in a boy's shop.

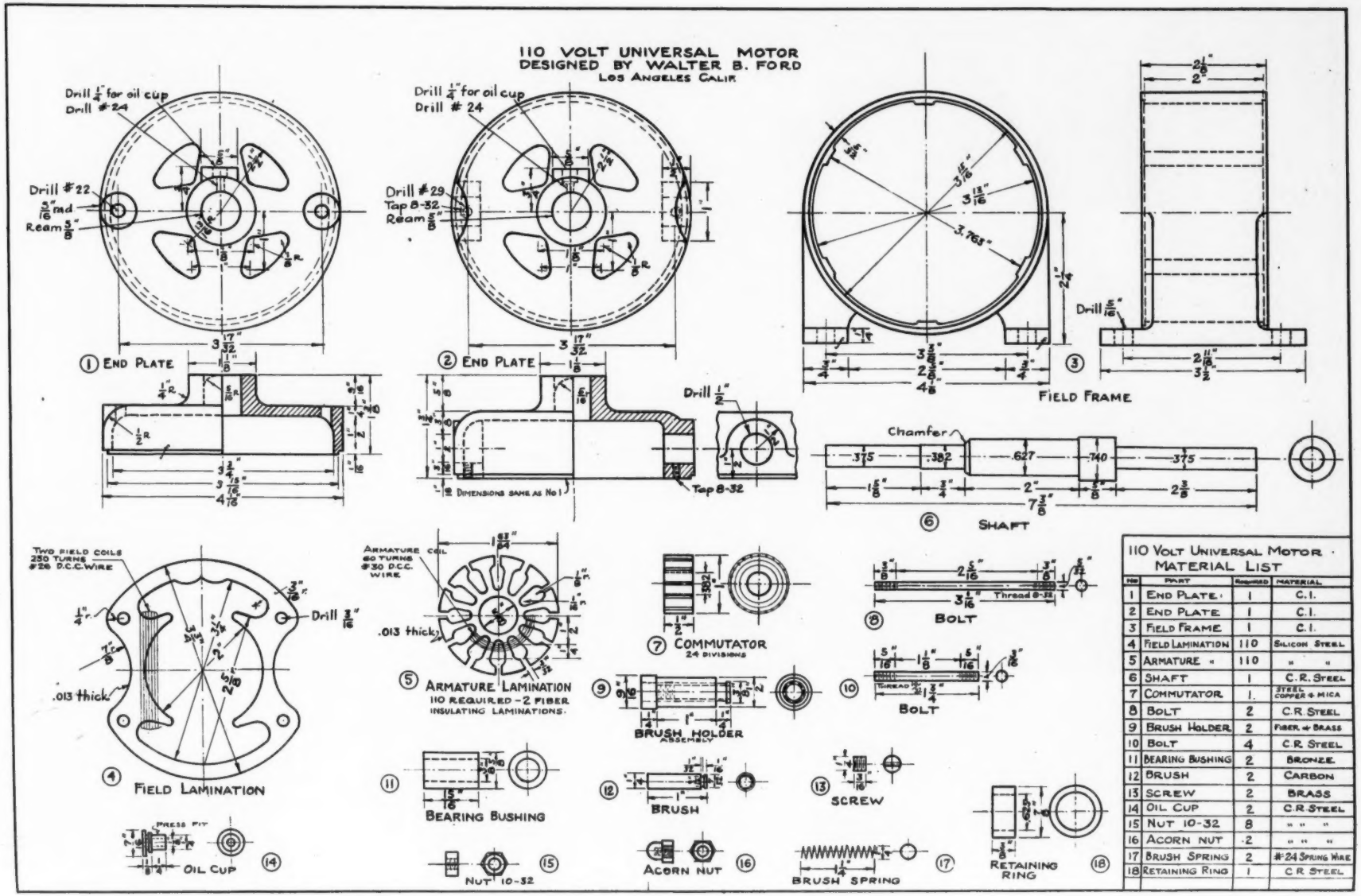
Although the castings and laminations may be purchased, details of both are given in the drawing so that they may be made in the school shop where facilities permit.

Construction

Field Frame (part 3, Fig. 1). Chuck field frame in lathe. Bore out to 3.753 in. Cut recess in each end of frame 3 15/16 in. diameter, 1/16 in. deep, as shown. Holes may be drilled in base if it is desired to secure the motor.



One-twelfth h.p. 110-volt universal motor



110 VOLT UNIVERSAL MOTOR · MATERIAL LIST

NO	PART	REQUIRED	MATERIAL
1	END PLATE	1	C.I.
2	END PLATE	1	C.I.
3	FIELD FRAME	1	C.I.
4	FIELD LAMINATION	110	SILICON STEEL
5	ARMATURE "	110	" "
6	SHAFT	1	C.R. STEEL
7	COMMUTATOR	1	STEEL COPPER & MICA
8	BOLT	2	C.R. STEEL
9	BRUSH HOLDER	2	FIBER & BRASS
10	BOLT	4	C.R. STEEL
11	BEARING BUSHING	2	BRONZE
12	BRUSH	2	CARBON
13	SCREW	2	BRASS
14	OIL CUP	2	C.R. STEEL
15	NUT 10-32	8	" " "
16	ACORN NUT	2	" " "
17	BRUSH SPRING	2	#24 SPRING WIRE
18	RETAINING RING	1	C.R. STEEL

Fig. 1. Details of one-twelfth h.p. 110-volt universal motor

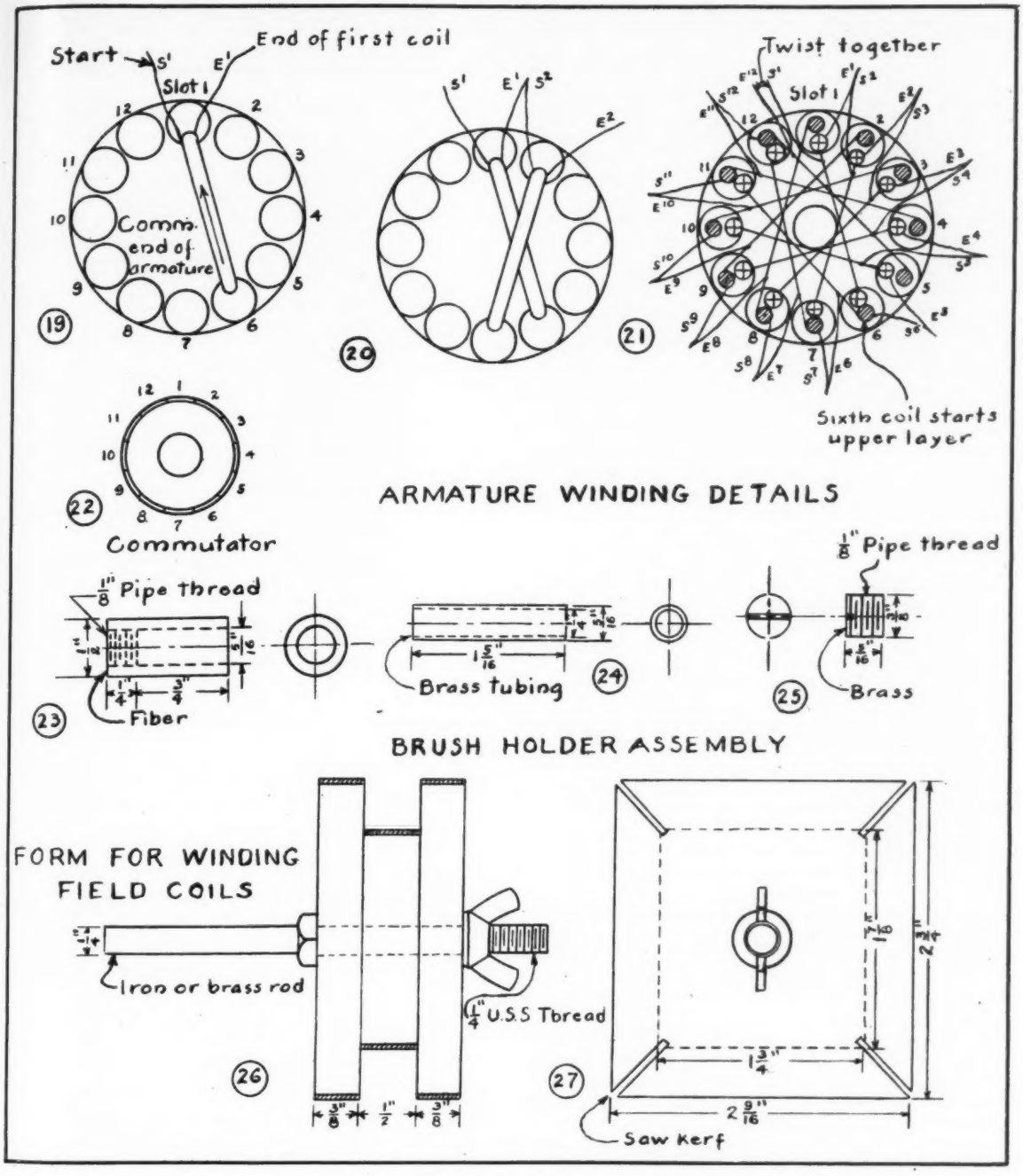


Fig. 2. Winding and armature details

End Plates (parts 1 and 2, Fig. 1). Chuck end plates and drill bearing holes with 39/64-in. drill and follow with 5/8-in. reamer. Then place them on mandrel between lathe centers, face, and cut shoulder to fit recess in end of field frame. Remove from lathe and press bearing bushings (part 11) into place. When pressing these bushings into the end plates, care should be taken that the strain be placed on the hub rather than on the arms of the plate. Drill holes for oil cups in end plates with 1/4-in. No. 24 drill, as shown in the illustrations of parts 1 and 2. While the holes specified above would suffice for oiling the motor, the addition of oil cups adds much to its finished appearance. Drill No. 22 holes for tie rods in end plate No. 1, and drill and tap end plate No. 2, for 8–32 machine screw, to receive threaded portion of tie rod. Drill 1/2-in. holes for brush holders in end plate No. 2 as shown (Fig. 1).

Armature Shaft (part 6, Fig. 1). The shaft should be turned from 3/4-in. screw-stock steel. The bearing surface should be finished to .375 in. The portion of the shaft upon which the commutator is pressed should be turned to .382 in. The portion of the shaft upon which the laminations are placed should be turned to .627 in. for a distance of 2 in., one end of which should be chamfered to permit the pressing on of the retaining ring (part 18, Fig. 1), after the laminations are in place.

Brush Holder (part 9, Fig. 1). The brush holder may be

purchased as a complete assembly, including carbon brushes and springs. Where it is desired to make the brush holders, the dimensions shown for parts 23, 24, and 25 (Fig. 2) must be followed. The body of the brush holder is made of ½-in. round fiber rod, 1 in. long, which is drilled through with a 5/16-in. drill. Tap one end of fiber with a ⅛-in. pipe tap to take brass retaining screw, part 25. The retaining screw, No. 25, is made of ⅜-in. round brass rod, threaded ⅛-in. pipe size. The brass sleeve, No. 24, is made of No. 20 gauge brass tubing. It is pressed into the fiber tube ¾ in. opposite the threaded end. The brush should be made of a good grade of brush carbon according to dimensions shown at No. 12, Figure 1. The brush spring, No. 17, Figure 1, may be made of either phosphor bronze or brass spring wire, No. 24 gauge.

Laminated Field (part 4, Fig. 1). Stack the laminations so that all holes line up and bolt them together with threaded rods, No. 10, and nuts, No. 15. Press assembled field into frame so that center line of field poles will be parallel with base of motor.

Armature (part 5, Fig. 1). Place insulating laminations on the shaft, follow with steel laminations, and place another insulating lamination against last steel lamination. Line up slots in armature laminations and insert small wood wedge in one slot to hold laminations in line while retaining ring is being pressed on. Press retaining ring, No. 18, over chamfered end of armature shaft and against armature laminations. Sufficient force must be applied so that laminations will be held securely in place.

Armature Winding. Insulate each armature slot with a piece of press paper, size 1½ by 1⅝ in. The paper should be folded in the center, parallel with the longer side, and placed in the slots so that an equal amount will project at each end of the armature. The ends projecting through the slots should be spread apart to facilitate placing the winding in the slots. Facing the commutator end of the armature, wind 60 turns of No. 30 d.c.c. wire from slot 1 to slot 6, as shown at 19, Figure 2. The wire is passed through slot 1, across the back of the armature, through slot 6, and across the front of the armature in the direction shown by the arrow. When 60 turns have been wound in place, the wire should be cut, leaving an end about 6 in. long. The second coil is wound in the same manner as the first coil from slot 2 to slot 7. The end of the first coil, E^1 and the start of the second coil, S^2 should be twisted together when the coil is wound (see 20, Fig. 2). The remaining ten coils should be wound in the manner described above, each coil spanning six slots and the end of one coil being twisted with the start of the next coil, as shown at 21. When all of the coils are in place, the end of the last coil, E^{12}, should be twisted with the start of the first coil, S^1. In order to clarify the winding instructions, the armature slots are represented by circles instead of the regular shape. Also single lines are used in 21 to indicate the coils. The points where the lead wires appear to join the line indicating the coil are merely to indicate that the particular lead is part of that coil.

Commutator. Since the expense of making a commutator of the type shown in the school shop would greatly exceed the cost of a commercial product, no details of commutator construction are given. While the commutator shown at 7 has 24 bars, a slot is provided between every two bars into which the leads are soldered which divides it into 12 sections. The commutator is pressed on the shaft so that segment No. 1 is directly opposite the space between slot 12 and slot 1. With the commutator in the position described above, the twisted lead, E^{12} and S^1, is connected to commutator segment No. 4, shown at 22, Figure 2. The next lead to the left, E^1 and S^2, is connected to commutator segment No. 5. Lead E^2 and S^3 is connected to commutator segment No. 6. The same order is followed around the commutator until all leads are connected. After the commutator has been connected the armature should be shellacked and allowed to dry, after which the protruding ends of press paper should be trimmed close to the armature. Strips of fiber, 1/16 in. thick should be forced in the armature slots over the coils to hold the windings in place.

Field Coils. The field coils are wound on a wood form, shown at 26 and 27, Figure 2. The form consists of three blocks of wood, held together by a threaded rod, hexagon nut, and thumb nut. Short pieces of wire are placed in the saw slots before the coil is wound to facilitate its removal after it is wound. Each field coil consists of 250 turns of No. 26 d.c.c. wire. After the coil is wound, the ends of the short wires which were placed in the saw slots are brought around the top of the coil and twisted together, after which the form may be taken apart and the coil removed. The coils should be taped with linen tape and shellacked, leaving about 6 in. of wire extending from each end of the coil. Since the coils may be easily reversed on the field poles to obtain the correct polarity, no attention need be given the direction in which they are wound.

Assembly. Insert brush holders in end plate. Place field coils in position on field poles. Connect one end of each field coil to brass portion of brush holder. This may be accomplished by soldering the wire directly to brush holder or by means of small brass clips which fit over the end of the brush holder. Screw threaded rods, 8, into end plate so that they hold brush holders in place. Place armature in position and slip end plates over armature shaft. Secure end plates in position with threaded rod 8 and acorn nuts 16. Insert brush 12 and spring 17 in brush holder and secure with screw 13 or 25, depending upon which type of brush holder is used. Connect remaining ends of field coils to cord and attachment plug. If there is too much end play, it may be necessary to place fiber washers on the shaft. The motor should be oiled and tested for grounds before being given this preliminary try-out.

The name of a dealer who will furnish all or any part of the motor described in the foregoing may be obtained by writing to the Service Division of the INDUSTRIAL-ARTS AND VOCATIONAL EDUCATION Magazine.

Some Questions Answered

SHELLAC-MIXING LACQUER

991. Q.: I have tried to purchase what you call "shellac-mixing lacquer," but have been unable to get it. Would you please let me know where this may be obtained?

One of the boys in the shop is making a bedroom set of ribbon-grained tanguile and desires a walnut water stain put on it. What would be best to use for this? — *R.V.L.*

A.: The Murphy Varnish Co., of Newark, N. J., manufactures the "shellac-mixing lacquer" and also the proper nonraising water stain of such color as you may desire. It is suggested that you use either brown mahogany, Adam brown mahogany, antique mahogany, or walnut. Follow the manufacturer's directions for manipulating the stain.

In spite of the nonraising features of the stain it is urged that the completed cabinetwork be freely sponged with clean, warm water, since tanguile is notorious for its grain-raising propensities. Let dry in a warm room overnight and then sand clean and true with a "hard" felt block and 4/0 split garnet paper. Stain as per directions on the package; dry; and seal with the shellac-mixing lacquer; dry; sand with a split 6/0 garnet paper; fill with a 16-lb. silex-base filler and dry 48 hours in a warm room; varnish with a four-hour varnish; dry 24 hours; sand with split 6/0 paper; revarnish; dry 24 hours, water-sand with 6/0 "wet-or-dry" paper; dry overnight; revarnish; dry 3 days; oil-rub with crude petroleum oil, FFF pumice stone, and felt. Clean off the rubbing sludge

(Continued on page 8A)

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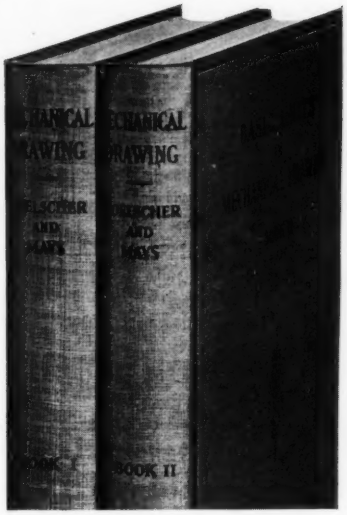

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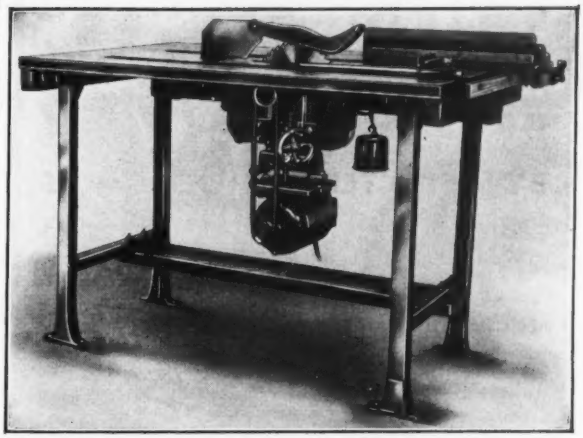
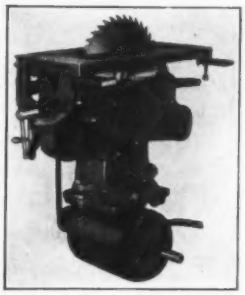
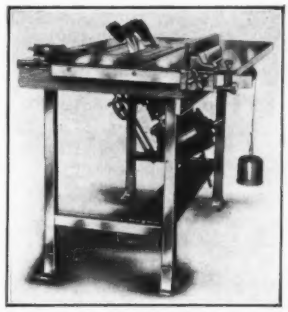


New DRIVER TILTING ARBOR SAW

A new idea in bench saws! This latest DRIVER development is unique in design, in utility and in value. This unit may be installed in any bench or table, the amount of working space around the blade depending only on the size of the bench top. With this unit the work is always flat and when angles are to be cut, the whole unit is tilted permitting every ounce of power to be utilized. There is no twisting of belt. No countershaft or idlers required. By simply detaching splitter and lowering saw blade the table top is cleared for any other project. A laminated table top of rock maple 30" x 48" x 1¼" is available. This table has brass miter gauge slots and the holes for the unit have been machined.



Standard equipment includes guard and splitter, counterweight, micrometer ripping fence, 30" support rack, belt, motor pulley and geared self-setting miter gauge.



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(Continued from page 364)

with a wad of clean waste which has been lightly wrung out of water and then used as a final rubbing to clean up to the perfect "satin" finish that is so much desired. — *Ralph G. Waring.*

VARNISH-REMOVING DIP

986. Q.: We would like to locate the name of a manufacturer of varnish remover of the type that is placed in a tank and the furniture dipped to remove the varnish. This material is available and is capable of removing the varnish from an ordinary chair or desk when immersed in from ten to thirty seconds. — *F.M.H.*

A.: I have delayed answering the Question No. 986 until I could secure data that I knew would be safe to use, as oftentimes a stripping solution of this type carries an appreciable amount of caustic which is rather dangerous, when handled by inexperienced operators.

The Schalk Chemical Co., 348 East Second St., Los Angeles, Calif., and the Oakley Chemical Co., Bush Terminal Bldg., New York, N. Y., make a safe stripping solution which will not be dangerous to use. — *Ralph G. Waring.*

Associations, Conventions

TEXAS ADVISORY COMMITTEE ON INDUSTRIAL ARTS

The second meeting of the Texas Advisory Committee on Industrial Arts was held on September 8 and 9, at the Stephen F. Austin Hotel, Austin, Tex.

The purpose of the committee is to co-operate with the State Education Department in promoting the interests of and maintaining high standards in the field of industrial-arts education. Typical of the work already accomplished by the group are the progress charts, teachers' manual, and student workbooks related to the laboratory of industries that have been developed to date. This material will be available through the office of the state director.

The officers elected for 1934–35 are as follows:

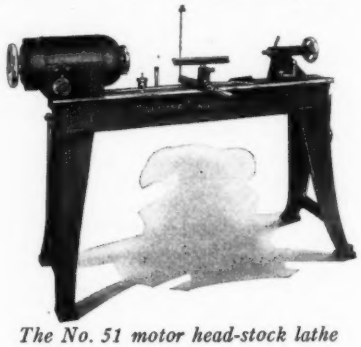
Chairman, J. G. Grove, Commerce; secretary, E. W. Glenn, College Station.

The next meeting of the committee will be held in connection with the State Teachers' Association Convention held during Thanksgiving Week, at Galveston.

SchoolShopEquipmentNews

NEW OLIVER NO. 51 MOTOR HEADSTOCK LATHE

The Oliver Machinery Company, Grand Rapids, Mich., has announced its new No. 51 Unit-Type Motor Headstock Lathe. The motor is of the adjustable-speed alternating-



The No. 51 motor head-stock lathe

current type, and has ½ h.p. capacity. It is equipped with over-sized self-aligning ball bearings which are amply strong to resist all reasonable radial and thrust loads. The speed may be varied from 600 to 3600 r.p.m.

(Continued on page 11A)

(Continued from page 8A)

The headstock is fitted with a spindle lock for changing the faceplate and a brake for stopping the headstock in the shortest possible time.

A built-in centrifugal-type governor tends to keep the speed constant at whatever speed the lathe has been set. The motor operates under full load at approximately 600, 1200, 1800 and 3600 r.p.m.

The lathe has a swing of 12 in. over the bed or 9½ in. over the carriage and will turn 24 in. long between centers on a 28-in. bed or 26 in. long on a 60-in. bed.

The Oliver No. 41 lathe embodies everything that makes for reliability, efficiency in operation, safety, power, flexibility in use and ease of manipulation.

NEW CATALOG OF SNAP-ON TOOLS

Snap-On Tools, Inc., Kenosha, Wis., has just issued a catalog of 96 pages devoted to a complete line of Snap-On tools, including their famous line of wrenches, small hand tool equipment, special tools, airplane tools, and selected shop equipment tools.

The booklet lists wrench sets, midget handles, midget sockets, ferret sets, general utility sets, socket wrench sets, nut spinner handles, master sockets, heavy-duty units, handle equipment, boxocket wrenches, heavy-duty end wrenches, tappet wrenches, short-handle combination wrenches, long brake wrenches, tire-servicing tools, supreme center punches, flat chisels, punches, ball-peen hammers, screw drivers, pliers, hack saws, and special airplane and automobile servicing tools.

A copy will be sent to any shop instructor upon request.

CATALOG OF ELECTRICAL PROJECTS

The Vocational Arts Supply Company, 1212 Venice Boulevard, Los Angeles, Calif., has issued its Catalog D for 1934–35, calling attention to its list of practical electrical projects and supplies.

The catalog lists a complete line of electrical supplies, including motor parts, radio key parts, radio tubes, soldering-iron parts, threaded element tubes, toaster and electric-stove parts, sockets, plugs, caps, resistance wire, heater cord, lamp cord, porcelain resistor supports, asbestos tubing, and asbestos paper.

A copy of the catalog is available to any shop instructor upon request.

News Notes

Citizens' Conference for Pennsylvania Schools

A Citizens' Conference on School Recovery for Pennsylvania schools was held on October 10 and 11, at Harrisburg. The conference was called by the governor of the state and was in charge of the state superintendent of public instruction. Among the topics discussed were, The State's Responsibility for Public Education, Organization and Administration of School Districts, and Effective Control of School Expenditures.

Montgomery Ward Offers Scholarships

Montgomery Ward, Inc., Chicago, Ill., has issued a descriptive booklet, explaining the purpose, plan, and scope of its Ward's College Scholarships which are offered to ambitious students who wish to attend a college. The scholarship plan is not a contest, but is a practical plan through which students in grade or high school may, with the aid of parents and friends, earn the cost of a college education. The scholarships vary in amount from $75 to $5,000 and the student is permitted to choose any educational institution he desires to attend. The booklet gives the approximate cost of a college course, lists a number of institutions, and outlines the conditions which must be fulfilled in obtaining a scholarship.

Welding Course Offered in New Orleans

A four-day welding clinic was inaugurated in New Orleans, La., beginning with October 24. The course is sponsored by the Linde Air Products Company and is the fourth of this kind to be sponsored by this company this year. The clinic aims to provide instruction in oxyacetylene welding and cutting methods.

Increase in Evening-School Enrollment

A 10-per-cent increase in the evening-school enrollment at San Antonio, Tex., has been reported by C. E. Trountz, principal of the school. New courses in lead burning and parental education have been planned for this year.

Here's a free Take-About for the Manual Training Department
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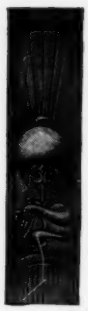

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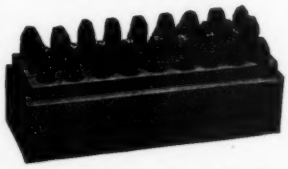

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